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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

Volume 17 SACRAMENTO, JANUARY, 1931 No. 1

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THE SPINY-RAYED GAME FISHES OF THE CALIFORNIA INLAND WATERS

By George Neale

He is an unfortunate angler who can not recall an exciting experience and conjure up a story or two when someone mentions the term *bass*, be it described as black, striped or calico. The bass, which are relatively strangers in the State, have not only been given the full hospitality of our waters but the efforts of the Bureau of Fish Rescue and Reclamation have been directed to the end of making their residence permanent.

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The bass, together with the sunfishes and perch, belong to a great group of fishes which are distinguished by the presence of stiff, unjointed rays or spines in the dorsal and anal fins, in addition to the flexible, jointed rays characteristic of such a fish as the trout. It is due to this feature that the group, or order, derives the scientific name *Acanthopterygii* (acanthos-spiny, pterygous-wing or fin)—the spiny-rayed fishes.

The writer does not propose to offer a scientific treatise on this group but feels that the reader may be interested in some of the information he has derived throughout a period of more than thirty years of practical experience in the field. During this time he has taken an active part in the distribution and, in some cases, the original importation of these fish into the waters of California.

As suggested above, the spiny-rayed game fish of the lakes, streams and rivers of California have, with the one exception of the Sacramento perch, been purposely introduced from distant territories.

The story of their importation from waters east of the Rockies is an interesting bit from the history of California, and well illustrates the desire of those people who traveled westward to have about them reminders of the pleasures of their old home.

The introduction of foreign fish has not been without consequent problems, for all animals are so integrally bound up in their relations with one another and with the plant life that one can scarcely foretell the results when a new animal is introduced into the tangle.

The large-mouthed black bass, for instance, has thrived in its new home with possibly greater success than in its old amid the waters of Lake Champlain. What changes in the animal and plant life have resulted from its presence in California? Has its prosperity been gained at the expense of some other fish?

Contrasting with the success of this stranger, the native Sacramento perch, once so abundant, has shown a decided decline in numbers. Why? One observer notes that they have an appetite for the young of an introduced catfish. These young, it appears, are armed with spines in the dorsal fins which are efficient weapons for tearing the tissues of the stomach of the perch which swallows them. But, to complicate this explanation, it appears that the striped bass, crappie and green sunfish also feed on the young catfish without noticeable injury.

While the angler baits his line with an attractive minnow for the bass, the fishes, in their turn, offer these interesting problems as bait for the naturalist interested in preserving those species most desirable to sportsmen and eater.

There are a very considerable number of species belonging to the spiny-rayed group in California and we shall list only those entitled to the privilege of being called fresh-water game fish. This list includes the striped bass, the large- and small-mouth bass, the crappie, the calico bass, the fresh-water rock bass and the Warmouth bass. Among the sunfishes are the blue gill and green sunfishes, the yellow perch and the Sacramento perch. Because of their importance in relation to the spiny-rayed fishes, we have included brief accounts of the bullhead or square-tail catfish, the mud or forked-tail catfish, the carp and the shad though these of our fish are not members of the order *Acanthopterygii*.



BLUEGILL, *Helioperca incisor* (Cuvier and Valenciennes)

There are interesting differences in the behavior and life history of each of these fishes, for no two kinds of animal life are in identical relationship with their environment. Furthermore, the behavior of each species will vary from time to time and place to place in accordance with changes in their environment.

The spawning season of the black bass, crappies and sunfishes, for instance, varies considerably according to the temperature of their locality. In shallow, warm water they spawn from March 1 to June 30; in the colder deep water from after April 1 to July 15; and in the higher altitudes as late as July 1 to August 15.

There are times between catches when the angler is afforded excellent opportunity for a study of the fish in his basket and few fish are more appropriate for the purposes of study than the bass. According to the scientists, the bass is a generalized fish, *i.e.,* its structure conforms to that expected of an animal that lives in the water. In the place of arms and legs, it bears fins. Two sets of these fins correspond respectively to the fore and hind limbs of the higher animals—the pectoral and pelvic or anal fins. In addition to these there is an appendage on the upper side of the fish termed the dorsal fin, and another at the posterior end known as the caudal fin. The caudal fin is the main agent of locomotion for fish, the others serving principally to maintain balance and depth in the water.

The structure of any given fish is admirably designed in accordance with the particular type of water in which it lives and its behavior in the acquisition of food. If one were to become thoroughly familiar with the life and activities of any fish, he could discover a logical reason for any peculiarity of structure that it might have. It is true, however, that many fish bear structures that have a function in ages past, but through some change in their environment they have become useless and usually appear only as vestiges. Those fish having a light colored belly will be found for instance near the surface of waters, whereas the fish which prefer the bottom of the stream will have a belly—ventral surface—noticeably darker in color.

Extending along the sides of all fish is a well defined line which varies considerably in contour according to the species. This is known as the lateral line. It is a sense organ, probably of as great value to the fish as are the ears or eyes of the higher animals. The lateral line in fish has been the subject of much investigation by scientists and there are many interesting speculations as to its exact function.

For the details of the head, the reader may refer to Figure 1. The head is built up of two types of bone—the calcareous bones, which form a greater part of the skull proper, and the membrane bones of which the operculum and the preoperculum are examples. The operculum serves as a protection for the gill arches on which are found the gills and their rich supply of blood vessels. The fish inhales water through the mouth producing a current which flows to the exterior over the gills and out through the operculum.

Attached to the gills are structures known as gill rakers which serve as strainers for the food material entering the mouth. The oxygen dissolved in the water is retrieved by the delicate membranes of the gills and after being transported through the blood stream serves as the fuel necessary for the metabolism of the animal.

On the fish forms under discussion, we may discover two types of scales—the etenoid and the eyeloid. Ctenoid is a term derived from the Greek *ctenos* meaning a comb. The scales of this pattern are attached to the skin of the fish by a number of small comb-like projections. The eyeloid scales are almost circular in shape. If one were to place a fish scale under the microscope, he would note that it is striated with a number of concentric rings or annulations. These rings, similar to the rings of growth in a tree, are accurate indicators of the age of the fish.

You will note that the eye of a fish possesses no eyelid, also that there are no external ears. The eyes of a fish are not capable of discerning the details of objects. Consequently, the appearance of any moving form causes the fish to dart for protection among the rocks or grass of the stream.

In our study of other animals, we are prone to interpret their reaction in terms of our own senses, but in our speculations concerning the fish we must appreciate that it lives in an entirely different environment from ours. The thoughtful angler, and it is taken for granted that anglers are thoughtful, may, between casts, find it profitable both to observe and speculate concerning the reactivities of those animals which live as successfully in their environment as we do in ours.

Let us briefly describe in the following pages the more prominent game fishes to be caught from the fresh waters of our State:

HOW TO IDENTIFY THE SPINY-RAYED GAME FISH OF THE CALIFORNIA WATERS

The most convenient means for the determination of the species of an animal is by the use of a so-called *key* such as the one that follows. In this key are listed those characters or structures which, when taken together, distinguish one group of fish from another. Some structures are common to many different kinds of fish but not to all fish. For instance, all of the fish on our list bear ventral fins attached to the thorax under, or slightly behind, the pectoral fins. (See Fig. 1.) Examine a trout or sardine and you will notice that the ventral fins are considerably behind the pectoral fins.

If the reader will refer to the key for the identification of the sunfish family, he will note in reading from numeral *1* to letter *A* to *a* and *b*, that the characters become more restrictive, until finally, if the key were carried to its limit, there would be a small group (species) of fishes having a number of characters different from those of any other kind of fish. The calico bass, according to the key, bear different markings from the white crappie though they may each carry, at times, the same number of dorsal spines. Thus, by a process of gradually restricting the characters, a key enables one to trace a specimen to a point where it belongs to one group and no other.

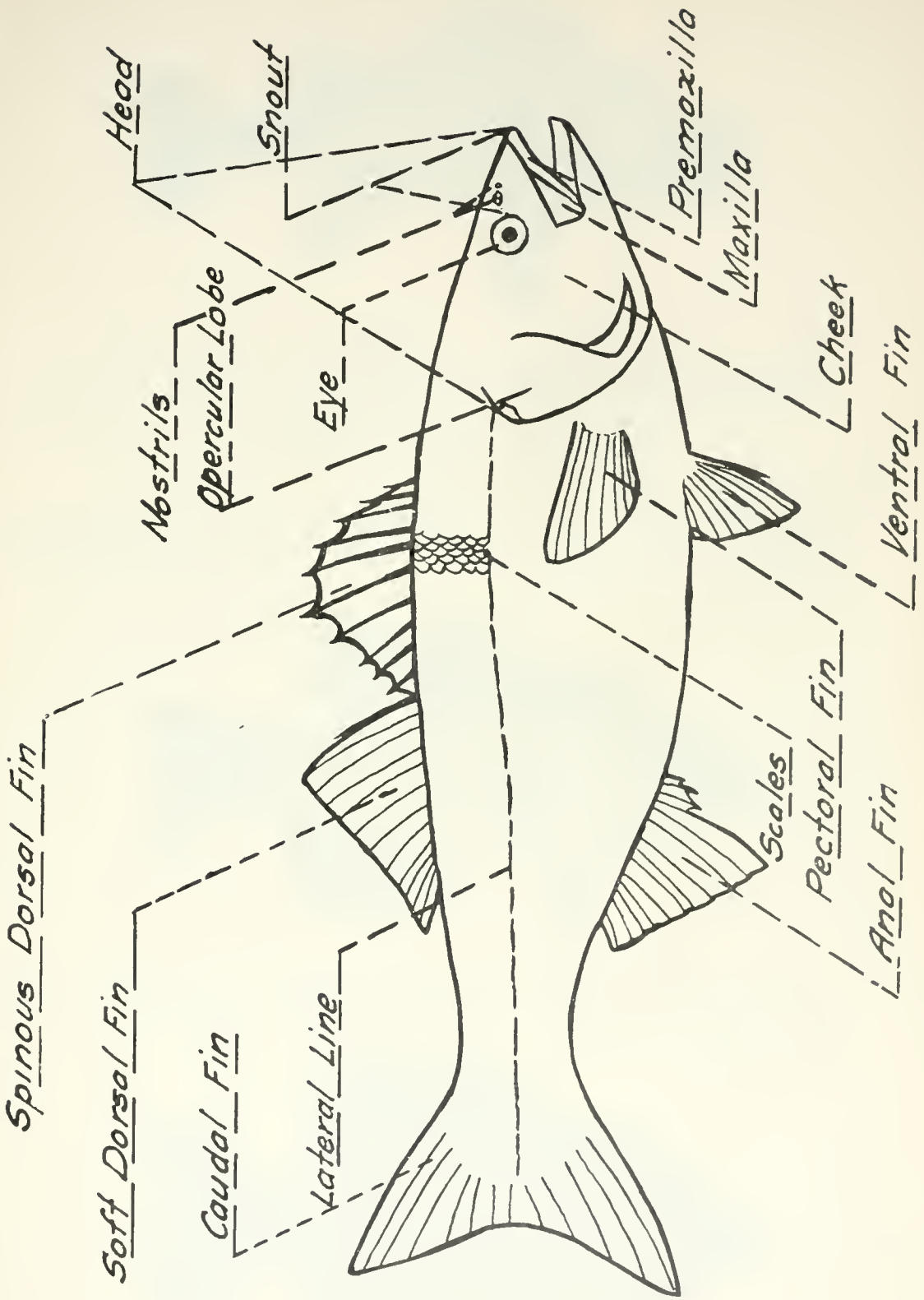


FIG. 1. Outline drawing of Striped Bass to show characteristics of spiny-rayed fish.

1 Ventral fins attached to thorax under or slightly behind pectorals.
A. Dorsal fin consists of two parts. The anterior part is composed of sharp, stiff spines; posterior part is made up of soft rays.
a. One or two slender anal spines. Body elongated.
Perch family: (Percidae) includes the yellow perch, the only species of importance to be found in California. See p. 12.

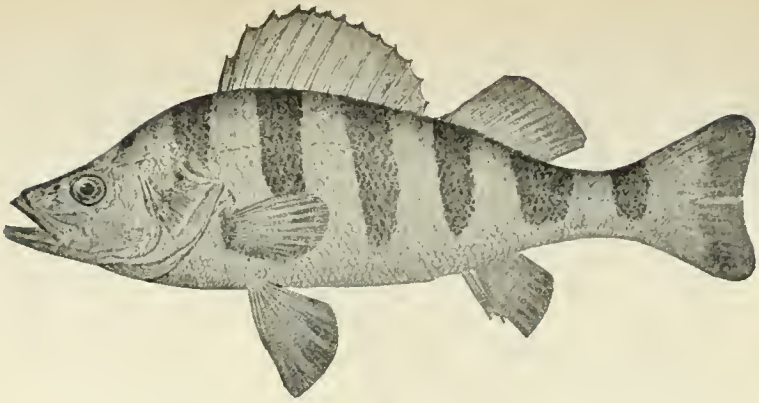


*Fig. 2. Yellow Perch.

aa. Three to nine stiff anal spines. Body flattened from side to side.
Sunfish family: (Centrarchidae) includes the two crappies, black bass, sunfishes, bluegill, large and small mouth bass.

HOW TO DISTINGUISH THE SEVEN IMPORTANT SPECIES OF THE SUNFISH FAMILY FOUND IN CALIFORNIA

Key for the identification of the sunfish family.

1. Dorsal fin about same length as anal or slightly longer. Anal spines, 6 or 7.
   A. Dorsal spines usually 5 to 8.
      a. Dorsal spines 6, rarely 5 or 7, dark cross-bars on a light background that tend to form rings on the sides of the body. Body somewhat elongated.
      White crappie. See p. 11.

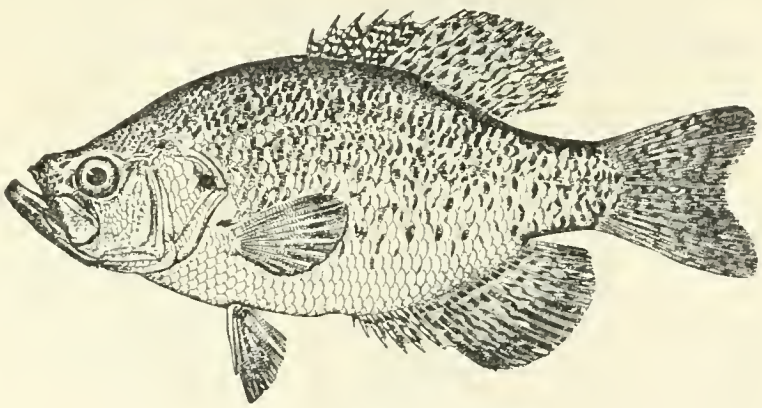


*Fig. 3. White Crappie.

aa. Dorsal spines usually 7 or 8, rarely 6 or 9, black markings on sides tend to form spots instead of rings. Depth greater than preceding form.
Black crappie or Calico bass. See p. 11.

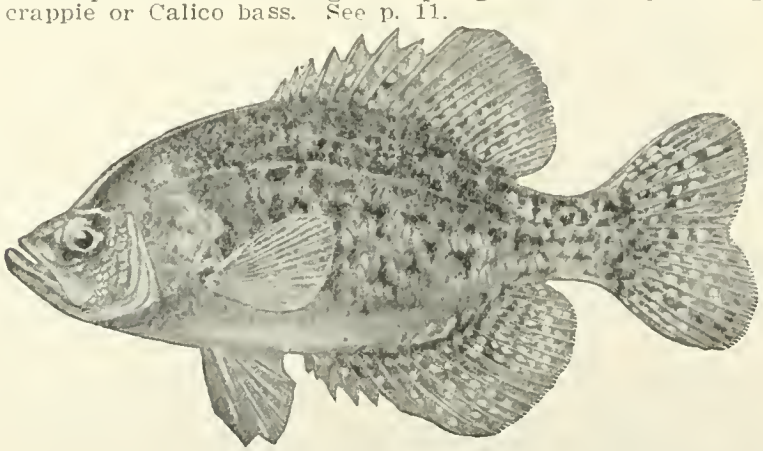


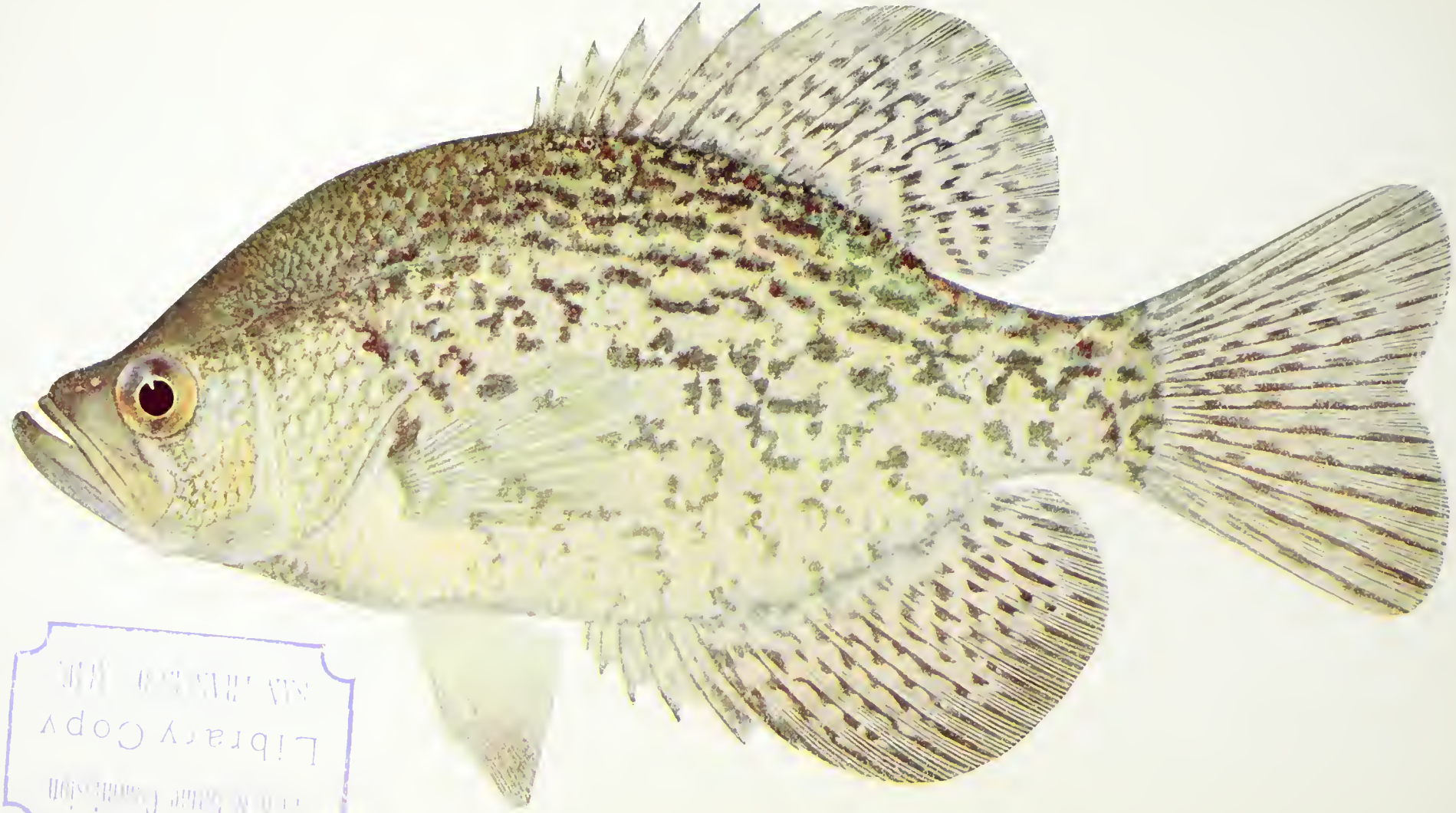
*Fig. 4. Calico Bass.

AA. Dorsal spines 11, rarely 10 or 12.
   a. Red eye; bronze color with small square black spots on sides forming stripes that run lengthwise of the body.
   Bock bass. See p. 11.

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WHITE CRAPPIE, *Pomoxis annularis* Rafinesque



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BLACK CRAPPIE, *Pomoxis sparoides* (Lacépède)

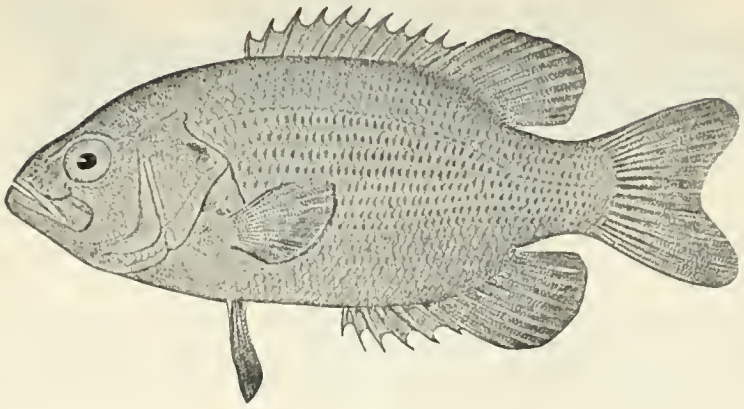


*Fig. 5. Rock Bass.

AAA. Dorsal spines 12 or 13.
a. Color blackish above; sides, silvery with about seven vertical blackish bars, irregular in form and position and more or less interrupted.
Sacramento perch. See p. 12.

2. Dorsal fin over twice the length of anal; anal spines 3.
A. Spinous and soft rayed portions of dorsal fin not separated by a deep notch. Body short and deep. Length exclusive of tail about twice depth. Never three times depth of body.
a. Rim on outside of black spot on gill cover soft and flexible; rim on inside of gill cover stiff and bony.
aa. Mouth large; large black spot at rear of soft dorsal and one at rear of anal. Dorsal spines low. Color dark green, usually with blue spots.
Green sunfish.

b. Black spot on gill cover thin and flexible throughout.
bb. Black flap on gill cover without pale margin, and not elongated or projecting upward. Dorsal spines high. Large black spot at rear of soft dorsal. Color olive with purplish luster.
Bluegill. See p. 11.

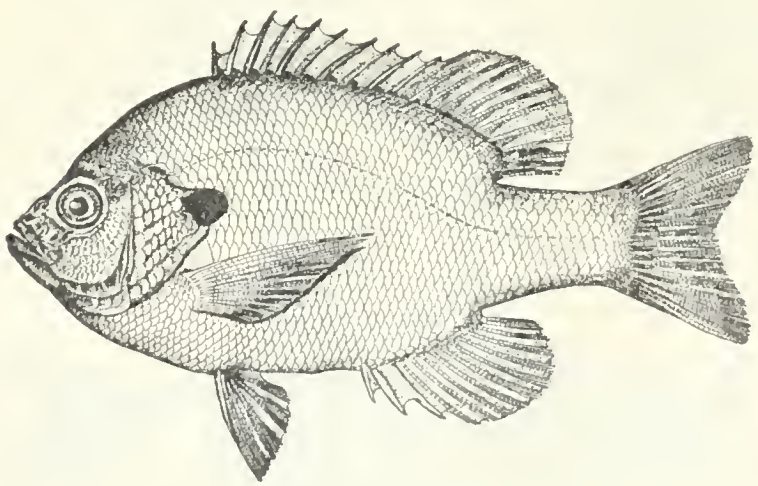


*Fig. 6. Bluegill.

AA. Spinous and soft-rayed portions of dorsal fin separated by a deep notch. Body elongated. Length exclusive of tail approximately three times depth.
a. Maxillary bone does not extend beyond eye, except in very old specimens. Eye red. Mouth moderate in size. 10 or 11 lengthwise rows of scales above the lateral line. Spinous dorsal long and low with very little variation in height. Color golden green with dark cross-bars.
Small-mouth black bass. See p. 10.

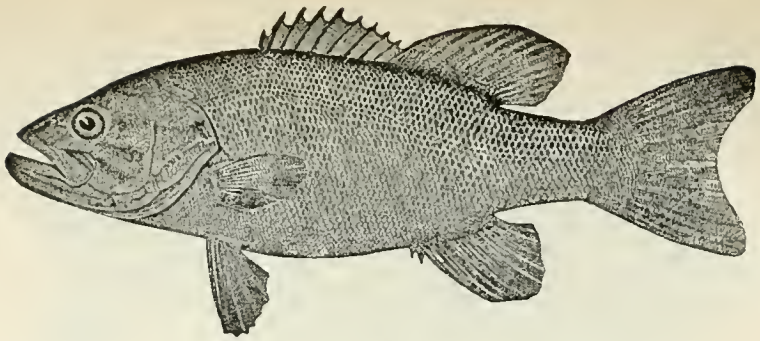


*Fig. 7. Small-Mouth Black Bass.

aa. Maxillary bone in adults always extends back of eye. Eye not red in adults. Large mouth. 7 or 8 lengthwise rows of scales above the lateral line. Spinous dorsal high in the middle forming a half circle. Color dark green. Black lengthwise streak along each side of body; except in large individuals.
Large-Mouth black bass. See p. 9.

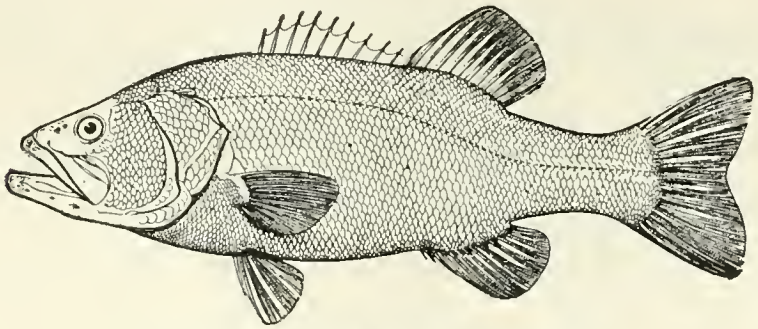


Fig. 8. Large-Mouth Black Bass.

Key for the identification of the catfishes.

IF: The tail fin is cut squarely off at the end or is slightly rounded inwardly (not formed or rounded deeply), the fish is a square-tail catfish. See p. 13.
BUT IF: The tail fin is forked or deeply rounded inwardly, the fish is a fork-tail catfish.

Striped Bass (*Roccus lineatus*)

Relationship: Order, Acanthopterygii; family, Serranidae—the sea bass.

Specific characters: Body deep and compressed; lower jaw projecting; dorsal fins entirely separate; three anal spines; graduated in size; scales large, ctenoid; silver-grey color with well-defined dark grey longitudinal stripes along the back. The average size is from four to eight pounds, though specimens have been taken having a weight of over eighty pounds.

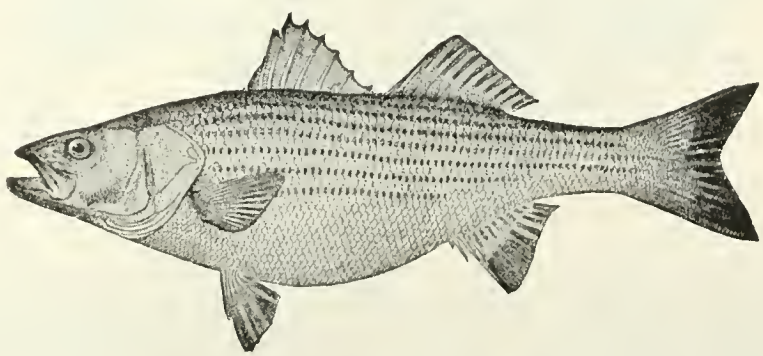


Fig. 9. Striped Bass.

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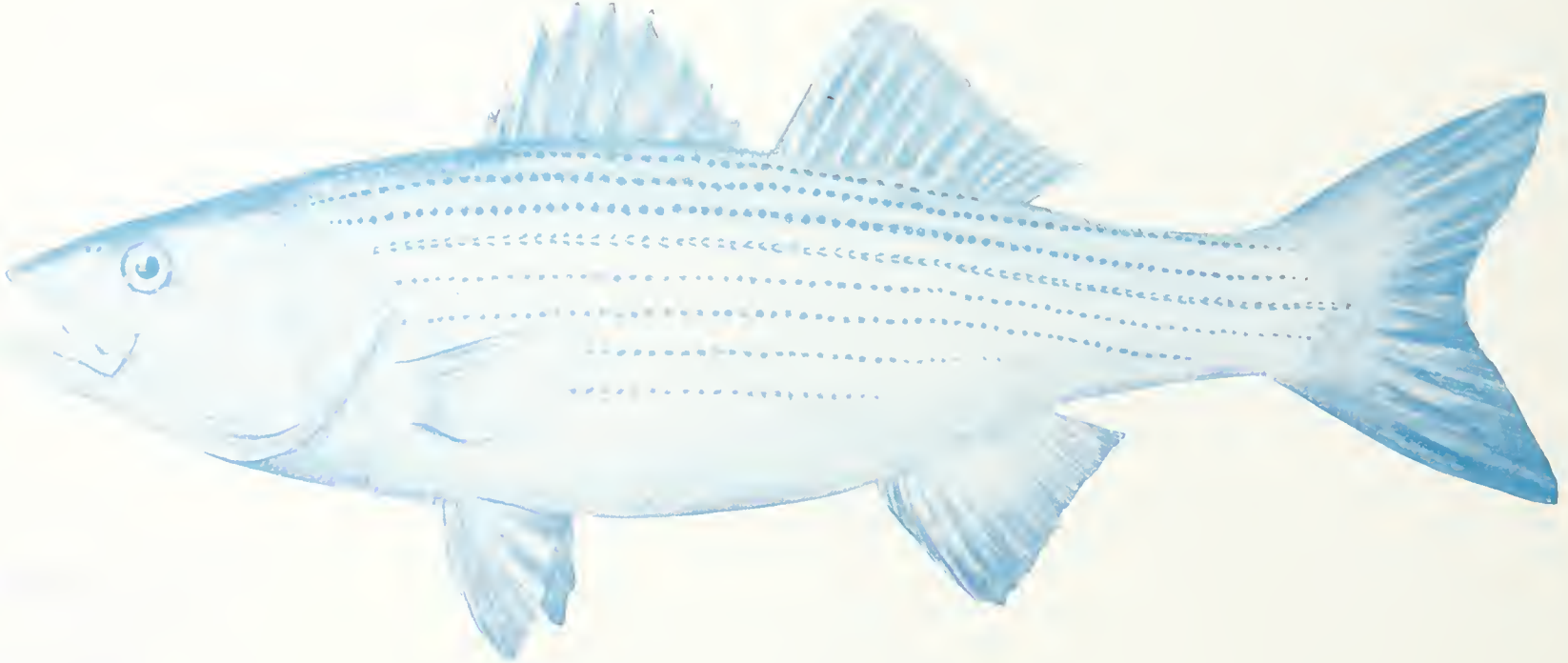


PLATE I. Striped Bass, *Roccus lineatus*.

Nativity: In 1879 one hundred and seven individuals were transplanted from the Navesink River, of New Jersey, to the Carquinez Straits. In 1882, three hundred young fish were transferred from the Shrewsbury River to Suisun Bay.

Distribution in California: The coast waters from the Oregon boundary to San Diego Bay; the Sacramento and San Joaquin rivers, their tributaries and a number of streams and lakes in southern California.

Fishing season: There is no closed season for the angler but there are certain legal restrictions concerning which the reader may refer to the fish and game laws of California. Two migrations occur: the spawning migration which begins during March and extends into June, and the "winter bass run" usually commencing in September and continuing from two weeks to two months. The latter is primarily a feeding run.

Fishing methods: A rod and reel or hand line is used when casting from a boat or the shore or while trolling. These fish are omniverous feeders and take a wide range of baits among which sardines, shrimps, clams, squib and live minnows are popular. The bait hooks used are usually Nos. 5, 6, or 7. Artificial lures: Stewart and Wilson's spoons Nos. 4, 5, and 6; Basserins, red head and lucky 13, and Heddon wiggler, dark or light according to the turbidity of the water. Use a heavy sinker when still fishing; when trolling, use at least a hundred feet of number 9 line and no sinker. These fish tend to swim in schools and once a strike is made in an area it may be repeatedly worked.

Notes: This is unquestionably one of the most desirable combination of game and commercial fish that migrates into fresh water. The flavor, when broiled or baked, is delicious and there are relatively few bones.

An excellent article on the California striped bass may be found in the CALIFORNIA FISH AND GAME for April, 1926, Vol. 12, No. 2.

In external features the bass represents a *generalized* bony fish, *i.e.*, its form is typical of fishes in general and it posseses no character such as fins, tail or mouth which have become highly modified.

Large-Mouth Black Bass *(Micropterus salmoides)*

Relationship: Order Acanthopterygii; family Centrarchidae. This is a member of the sunfish family—spiny-rayed fish only found in fresh waters.

Specific characters: The only diffieulty in determining the large-mouthed black bass exists in the ability to distinguish it from the small-mouth bass—another species of the same genus. In the large-mouth form the maxillary extends beyond the eye, the seales of the cheek are nearly as large as those of the body and the ten dorsal spines make a decidedly more acute curve than those of the small-mouth species *i.e.*, the dorsal fin is decidedly notched. The large-mouth is stockier in form and darker in color than the small-mouth, with longitudinal markings more pronounced. Length, 15 to 18 inches.

Nativity: The large-mouth bass is involved with the small-mouth in its introduction and we shall combine the history of both forms. In 1874, Dr. Livingstone Stone imported 75 full-grown spawning bass from Lake Champlain, Vermont, and 24 small fish from St. Joseph River,

Michigan. Both of these shipments were most probably of the small-mouth variety. The first shipment was placed in Napa Creek and the 12 survivors of the second in Alameda Creek. In 1879 he made a second shipment of 22 mature fish which were planted in the Crystal Springs Reservoir, San Mateo County. These fish increased rapidly and, later, hundreds of their progeny were consigned to various waters of the state. The United States Commission in 1891 deposited 2000 yearling large-mouth bass in Lake Cuyamaca, San Diego County, and 620 in the Feather River near Gridley. In June 1895, at the request of the California Commission, the United States Commission delivered 2500 large-mouth bass fry which were placed in the ponds of Sisson Hatchery from which station they were widely distributed in the northern and southern parts of the state.

Distribution in California: These fish have been widely distributed throughout the state and in the majority of the waters they have reproduced very successfully.

Fishing season: The fishing season corresponds with that of the Sacramento perch, crappie or any of the other sunfishes. There are certain restrictions and limits for which refer to the California fish and game laws.

Fishing methods: These fish, due to certain limitations in their mouth parts, are not such omnivorous feeders as the striped bass. They will take a minnow, a snail, or a worm and a variety of artificial lure. Both the large and small-mouth bass will put up a good fight and the fishing methods are similar to those used for any of the sunfish.

Notes: The male of this species builds a crude nest in shallow water. Then, seeking his mate, he attracts her to the nest. After the eggs are laid, he drives her away and personally guards the nest until the young are well grown.

Small-Mouth Black Bass (*Micropterus dolomieu*)

Relationship: The same as that of the large-mouth bass.

Specific characters: The maxillary reaches only to the front of the eye and the head is one-third the length of the body. There are 10 soft rays in the anal fin as compared to the 11 which are characteristic of the large-mouth species. There is no decided notch in the dorsal fin of the small-mouth and it is more slender and lighter in color than its large-mouth cousin, also, the stripes on its cheeks are more prominent.

Nativity: See the data under *Micropterus salmoides*.

Distribution in California: This species is more exacting in its choice of environment than any other member of the spinous group. Shunning the sluggish waters of the valleys, they share with the trout the clear, cold water habitat of the gravel and rock-bottomed mountain streams. Their food habits resemble those of the trout and, like them, they are found in the cold streams from Canada southward.

Fishing season: The same as that for the large-mouth bass.

Fishing methods: The small-mouth will rise to a fly, take a spinner, live minnows or a frog. They are uncertain in their time of feeding and decidedly temperamental in their feeding habits. The angler must not expect much sport from bait fishing but there is a decided thrill resulting from their rush to the moving lure.



PLATE II. Large-mouth Black Bass, *Micropterus salmoides*.
Courtesy of the Canadian Pacific Railway Company.



PLATE III. Small-mouth Black Bass, *Micropterus dolomieu*.
Courtesy of the Canadian Pacific Railway Company.

Notes: The small-mouth bass is the peer of its family from the sportsman's viewpoint. It is a fitting rival of the trout and has a flavor equally delicious.

Crappie *(Pomoxis annularis)*
Calico Bass *(Pomoxis sparoides)*

Relationship: These are spiny-rayed members of the same family as Micropterus. Since the two forms are so similar in character, habits and appearance, we shall describe them under the same heading.

Specific characters: In addition to those given in the key, the following features may aid in determining the difference between the crappie and the calico bass. The crappie is not so deep or robust as the calico bass; its mouth is somewhat larger and the snout more prominent. The eye of the former is slightly larger and the membrane of the jaws is noticeably thin and transparent—a feature from which it derives the popular name of "tin-mouth." There are six spines in the dorsal fin of the crappie and seven in that of the calico bass.

Nativity: Both species were introduced from Illinois in the early nineties. They were not widely distributed at that time, but in 1901 a shipment to Sacramento was extensively released.

Distribution in California: These fishes are numerous in the Sacramento and San Joaquin valley waters and abound in nearly all sloughs, dredger cuts, canals, lakes and rivers where the current is not too swift.

Fishing methods: These fish afford good sport with a light tackle and, in clear water, will rise to a fly, take a worm or grasshopper. They are partial to a small spinner when fished deep near the edge of weeds or any aquatic growth where the black bass like to wait for their prey. Use the lightest tackle with Nos. 3 to 5 hooks on gut snells. Fly fishing is more successful during the late afternoon hours and the gray drake, black gnat or any of the hackles on hooks Nos. 4 or 5 are recommended.

Bluegill Sunfish (*Helipercа incisor*)
Green Sunfish (*Apomotis cyanellus*)

Relationship: The same family as the crappie and calico bass.

Specific characters: These fish belong to a group which the scientists have found difficult to classify. The external characters which serve to distinguish one species from the other are best gained from observation of the pictures herein published.

Distribution in California: The flood waters of northern California rivers and streams have tended to give these species a wide distribution. They show a decided preference for clear, still waters where there is plenty of aquatic growth.

Fishing methods: Use a light rod and any of the tackle which might be selected for trout.

Notes: Any of these three fish are particularly recommended as a table delicacy and, as to fighting qualities, they compare with any fish of similar size.

Rock Bass *(Ambloplites rupestris)*

Relationship: Order Acanthopterygii; family Centrarchidae—the same group as the crappie, calico bass, Sacramento perch, etc.

Specific characters: This fish resembles the black bass though it is noticeably deeper and more compressed. The dorsal and anal fins

are longer and stronger than those of the bass. It is quickly distinguished by the scarlet iris of the eye from whence it derives the popular name "red eye."

Nativity: Introduced into California in 1891 from Illinois.

Distribution in California: The rock bass have not thrived so abundantly as other members of the family and but very few are found in waters where there are no other bass.

Fishing season: The same as for black bass, calico bass and the other sunfish. See fish and game laws.

Fishing method: A light four or five-ounce fly rod and trout flies Nos. 5 to 7 make an excellent tackle. The flies must be allowed to sink with every cast. Live minnows make good bait and there is good sport derived from trolling with a small spoon.

Notes: This bass spawns in the spring and early summer. Like the black bass, the male builds a nest which it guards until the young are able to take care of themselves.

Yellow or Ring Perch (*Perca flavescens*)

Relationship: The family percidae of the spiny-rayed order.

Specific characters: This is the most colorful of any of the fish of our group and is easily distinguished by its dark olive back, golden yellow sides and pinkish belly. The lower fins are usually bright red or orange and the body is striped with six or more broad, dark bands.

Nativity: Introduced into California in 1891 from the state of Illinois.

Distribution in California: Like the rock bass, which accompanied them in their introduction to California, the yellow perch has been only moderately successful. They will rarely be found in waters where there are no bass.

Fishing season: The same as that for the rock bass.

Fishing methods: The methods to be used are similar to those applied with the rock bass or the other members of the group weighing from a half to over a pound.

Notes: The yellow perch run in schools and all the members of a given school are similar in size. The young are striking in appearance and apparently attractive to the bass who attack them with avidity.

Sacramento Perch (*Archaplites interruptus*)

Relationship: The Sacramento perch is a member of the family Centrarchidae and is closely allied in structure to the fresh water rock bass.

Specific characters: Its form is similar to that of the rock bass, but it differs in having more teeth on the tongue and a greater number of gill-rakers. It differs considerably in color being uniformly black or brassy. It displays several irregular vertical bars and there is a black spot on the angle of the gill cover.

Nativity: This is the only fresh water, perch-like fish indigenous to waters west of the Rockies. It was named in 1854 by Girard.

Distribution in California: The waters of the Sacramento and San Joaquin rivers. It has noticeably decreased in numbers during the past few years. (See notes below).

Fishing season: The same as that for other sunfish.



YELLOW PERCH, *Perca flavescens* (Mitchill)



PLATE VIII. Sacramento Perch, *Archaplites interruptus*.

Fishing methods: Similar to those for the rock bass.

Notes: The eggs of the perch are held together by a gelatinous substance and laid in long strings which become draped over sub-aquatic plants and submerged roots. Thus, they are conspicuous in the water and attract the attention of the catfish and carp who eat them in large quantities. The balance of animal life that was once so favorable to these little perch, changed with the introduction of the carp, catfish, striped bass, etc., and today it may only be found in those few places where the foreign species are rare or absent.

There are three fish, the carp, the catfishes and the shad, which, though not members of the spiny-rayed game fish, bear such an economic relation to the latter that it is deemed relevant to include them in this paper.

Carp (*Cyprinus carpio*)

The carp is also a stranger in California and the desirability of its importance is somewhat questionable for, though it has positive values, this much-traveled oriental is accused of being a decided food competitor of the larval bass in addition to consuming the spawn of many game fishes.

Five individuals were brought from Holstein, Germany in 1872, their forefathers having been introduced into Europe from China. In 1877, the California Commission received some 88 carp from the Japanese government in exchange for a consignment of trout eggs. In 1879 and again in 1882, lots amounting to 297 fishes were received from the federal government.

The carp makes a pleasing food when properly prepared and may sometime gain in popularity though, at present, little carp rescue is carried on by the Bureau of Fish Rescue and Reclamation of the Division of Fish and Game.

The Catfishes—Order Nematognathi, the thread-jawed fishes

Square-tail Catfish *(Ameiurus nebulosus)*

Fork-tail Catfish *(Ameiurus catus)*

Both of the above fishes were transplanted from Vermont and New Jersey in 1874. They seem to have thrived better in California than in their native waters of the east and middlewest.

The value of the catfish as a delicious table delicacy has only been appreciated by the California appetite during very recent years. Apparently too cheap and ugly to make an appeal in our local markets, they have been profitably shipped in great numbers to the markets of states from which they originated. They may be caught with almost any bait in fresh waters where there is a mud bottom.

The Shad (*Alaso sapidissima*)

The shad was the first foreign species to be introduced into California. On June 17, 1871, Mr. Seth Green left New York with 12,000 young shad fry. Of these, 1000 survived the trip and were planted in the Sacramento River at Tehama. Their success is attested by the hundreds of tons that are annually sold in the state and exported elsewhere. They are partial to fresh shrimps, put up a good fight and, during the seasonal run in the Sacramento and larger streams, they make excellent fishing with light tackle.

CONSERVATION

None of the spiny-rayed fishes are propagated in the state hatcheries for, but with one exception, the eggs can not be taken from them and hatched as are those of the trout and salmon. Replacements, therefore, must be made from the natural spawning areas.

Possibly one of the most important works of conservation instituted by the Department of Natural Resources, Division of Fish and Game, has resulted from the creation of the Bureau of Fish Rescue and Reclamation. By virtue of its endeavors, valuable food and game fishes that would become the prey of predatory birds and mammals when left stranded by receding waters are reclaimed and returned to permanent waters.

FUTURE SUPPLY ASSURED

The rescue bureau goes a step further than just netting and rescuing fish and returning them to the water from whence they came. Every advantage is taken to maintain a permanent supply and to distribute them to other adaptable waters, all over the state. In the seining operations, the parent fish, which are generally found with their young, are returned to the main bodies of water with about fifty per cent of the young fry. The surplus are used to fill the many applications for them, which are made to the fish cultural department. In this way a future supply is maintained and assured.

These natural outdoor hatcheries are so situated by nature that they could not be duplicated by artificial effort except at an immense cost. The propagating areas are formed generally in the lowest lands at the confluence of two streams, such as the Sacramento and American rivers or the Mokelumne and Cosumnes. These four streams alone with their tributaries furnish eighty per cent of all the spiny-rayed fish rescued and distributed to all parts of the state. An estimate of the area of these outdoor natural hatcheries in a normal winter of rainfall is about 70,000 acres of surface water, composed of small ponds and lakes and overflowed areas, of from one to four hundred acres each. Nearly all of this area is connected at flood water with some important river or lake, where these fish abound.

The most essential elements in all waters containing fish are food, spawning grounds and an abundance of subaqueous plant life, which furnishes both food and shelter for the young fish, and without which there can be little or no natural propagation. These natural hatcheries contain all of these elements, their propagation costs nothing, they require no feeding as do artificially hatched fish, no buildings or attendants. There is no element of disease, no watchful eye of the fish culturist—nature does it all without cost, but when nature has completed her wonderful work, then conservation begins. The young and adult fish must be removed to permanent waters, over-fished waters must be stocked, barren waters must be supplied to furnish sport and food.

IMPORTANCE IN OTHER STATES

The states of Illinois, Iowa, Indiana, Kansas, Minnesota, Nebraska, Wisconsin, South Dakota, Louisiana, Missouri, Michigan, Connecticut, Ohio, Oklahoma, and a number of other states not so favored by trout waters as is California, derive a large portion of their license revenue

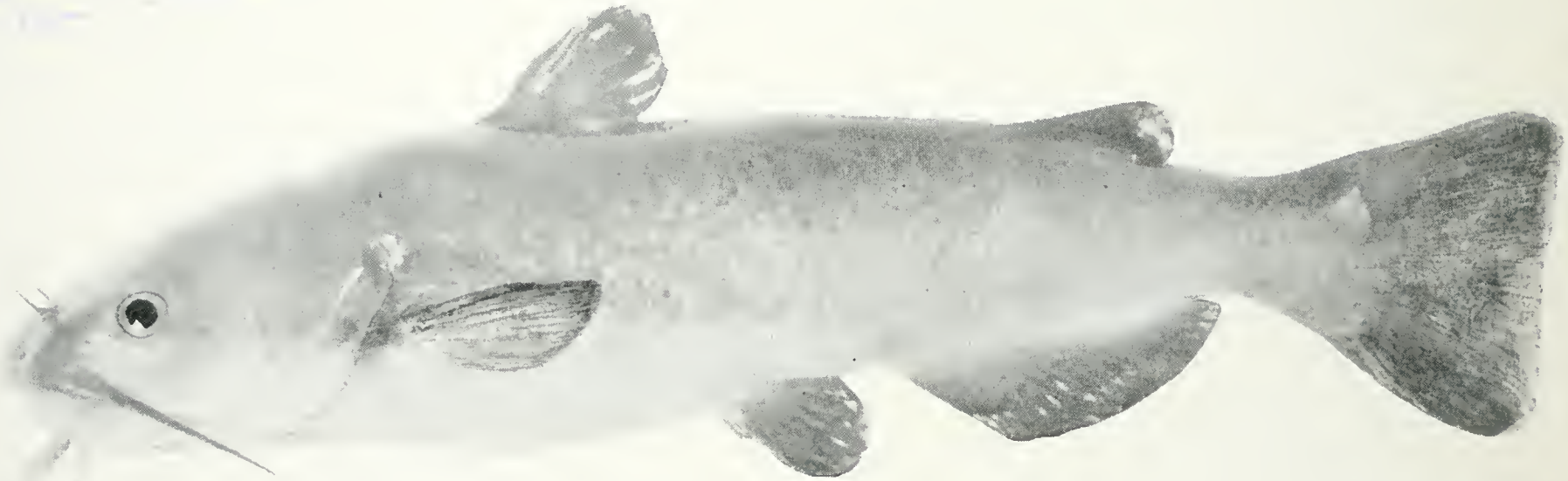


PLATE IX. Square-tail Catfish, *Ameiurus nebulosus.*



PLATE X. Fork-tail Catfish, *Ameiurus catis*.

from these spiny-rayed fresh water game fishes. They specialize entirely upon the propagation of this tribe of fishes at a cost of from twenty-five to forty dollars per thousand.

With the single exception of the yellow perch, the spiny-rayed fishes can not be propagated artificially as are trout and salmon. They can not be stripped of their eggs as are trout, hence the necessity of these states creating seminatural or artificial outdoor propagating ponds in order to maintain the demand by the anglers of these states. Many of these states expend a large amount of their income in the propagation of these fish. Arkansas claims to maintain the largest acreage of propagation ponds in America—a series of ponds just completed at a cost of $175,000. The state of Illinois operates eleven seminatural ponds for spinous fish. They also operate four rescue stations with crews. This would indicate the value of these game fishes to these states.

Such expenditures will not be necessary in this state, as long as the fish are rescued from the immense natural propagating areas in the Sacramento and San Joaquin Valleys. The growing demand for both large- and small-mouth black bass can be met by setting aside certain natural ponds or lakes which may be acquired by rental and maintained as bass propagating waters. There are many such ponds and reservoirs in the lower altitudes, in fact the chiefs of the Bureau of Fish Culture and Fish Rescue are now working on such a project.

Total Number of Fish Rescued From August 1, 1928, to June 30, 1929 by Species

Green sunfish	374,705		
Bluegill sunfish	65,407		
Crappie	29,231		
Striped bass	122,408		
Catfish	154,117		
Black bass	218,419		
Rainbow trout	3,435		
Salmon	350		
Yellow perch	1		
Sacramento perch	100		
		968,173	
Hanford Rescue crew } all species		157,905	
Newman Rescue crew }		155,626	1,281,704

Total Number of Fish Rescued From July 1, 1929, to June 30, 1930

Green sunfish	2,249,623		
Bluegill sunfish	367,071		
Crappie, calico bass	927,453		
Catfish	252,765		
Striped bass	10,004		
Black bass	1,700,088		
Rainbow trout	40,140		
Salmon	156		
Sacramento perch	8		
		5,547,308	
Aided by volunteers of Sacramento County		141,313	5,688,621
Grand total rescued to June 30, 1930			6,970,325

Approximately 75 per cent of the rescued fish are what we have classed as number "ones," two inches or less in length. Twenty-two per cent are yearlings and 3 per cent are adults of all sizes. We have devised a system by which we are able to count small fish by small dip net measurement, which is approximately 98 per cent correct. All figures are very conservative.

One of the outstanding accomplishments of the Bureau of Fish Culture and Rescue is the successful transportation and planting of two carloads of striped bass—5000 fish of from four to six inches in length to the Salton Sea in Riverside and Imperial counties. This body of

water is of a saline nature and is 45 miles in length and 15 in width. It is one of the most important experiments in fish introduction into waters of like character anywhere.

The following distribution of rescued fish to barren waters has been made possible by the fine cooperation given by the Bureau of Fish Culture and Distribution.

Season of 1928, August 7 to December

Diez Lake, Inyo County, Crappie, catfish, sunfish	1,200
Big Bear Lake, San Bernardino County, Catfish, sunfish	300
Ponds at Atherton, San Mateo County, Black bass	12
Steinhart Aquarium, San Francisco County, Black bass	24
Feather Hill Ranch, Santa Barbara County, Catfish, crappie	650
Altadena ponds, Los Angeles County, Sunfish	50
St. Mary's College, Contra Costa County, Sunfish, crappie	300
Searsville Lake, Santa Clara County, Bluegill, sunfish, crappie	100
Laguna Lake, Orange County, Catfish	150
Fairmont Lake and Evans Lake, Riverside County, Black bass, Sunfish, crappie, bluegill	1,515
Eagle Lake, Lassen County, Crappie, black bass, sunfish	1,322
Guadalupe Lake, Santa Barbara County, Catfish	300
Santa Anita Dam, Los Angeles County, Catfish, sunfish	?
Foss Lake, San Diego County, Catfish, sunfish, crappie	540
Henshaw Lake, San Diego County, Sunfish, crappie, catfish	695
Hughes Lake, San Diego County, Catfish	1,000
Riverside Lake, Riverside County, Black bass, crappie, sunfish	1,605
Corners Station, Kern County, Black bass, crappie, sunfish	664
Bakersfield Athletic Field, Kern County, Black bass, crappie, sunfish	700
Stanislaus River, Black bass, crappie, sunfish	1,822
Kings River, Kings County, Catfish	15,000
Cross Creek, Kern County, Catfish	40,000
Kaweah River, Tulare County, Catfish	40,000
Kern River, Kern County, Rainbow trout	137

Season of 1929

Lake at Redding, Shasta County, Sunfish, crappie	2 cans
Lake at Watsonville, Black bass	4 cans
Los Gatos, Black bass, crappie, sunfish	3 cans
Los Angeles, Black bass	8 cans
Vallejo, Black bass, crappie, sunfish	12 cans
San Diego, Black bass	126 cans
Susanville, Crappie	126 cans
Lincoln, Placer County, Black bass	2 cans
Redwood City, Catfish, crappie	2 cans
Lone Pine Chamber of Commerce, Catfish, crappie	1,000 fish
Dan Payne, Ashland, Oregon, Catfish	60 fish
Oregon Chamber of Commerce, Oregon, Catfish	?
Golden Trout Club, Lone Pine, Crappie	36 cans
Yuba Fish and Game Association, Black bass, crappie	126 fish
El Centro Chamber of Commerce, Striped bass	140 cans
El Centro Chamber of Commerce, Striped bass	60,000 fish
Turlock reservoir, Catfish	

A can carries from four to eight large adult fish, according to the size of the can and the fish. A can's quota of small fish is from 40 to 100.

The rescue and distribution of the game and food fishes is one of, if not the most forward conservation measures accomplished by the Department of Natural Resources. The value of the food supply, the pleasure afforded to men, women and children in their pursuit, cannot be estimated in dollars. All of the spinous fishes are the equal, if not more delicious as a pan fish, than trout. They are available to those who are unable to go to the mountain streams for trout.

In addition to rescue work, I am making an analysis of the stomach contents of the spiny-rayed fishes in an effort to learn which of the species are most predatory. Also particular attention is given to the range of the spawning season. This will enable us to determine the right season in which to take them. A record of overflowed lands, fed from waters that contain edible fish is kept. Also a record of all fish

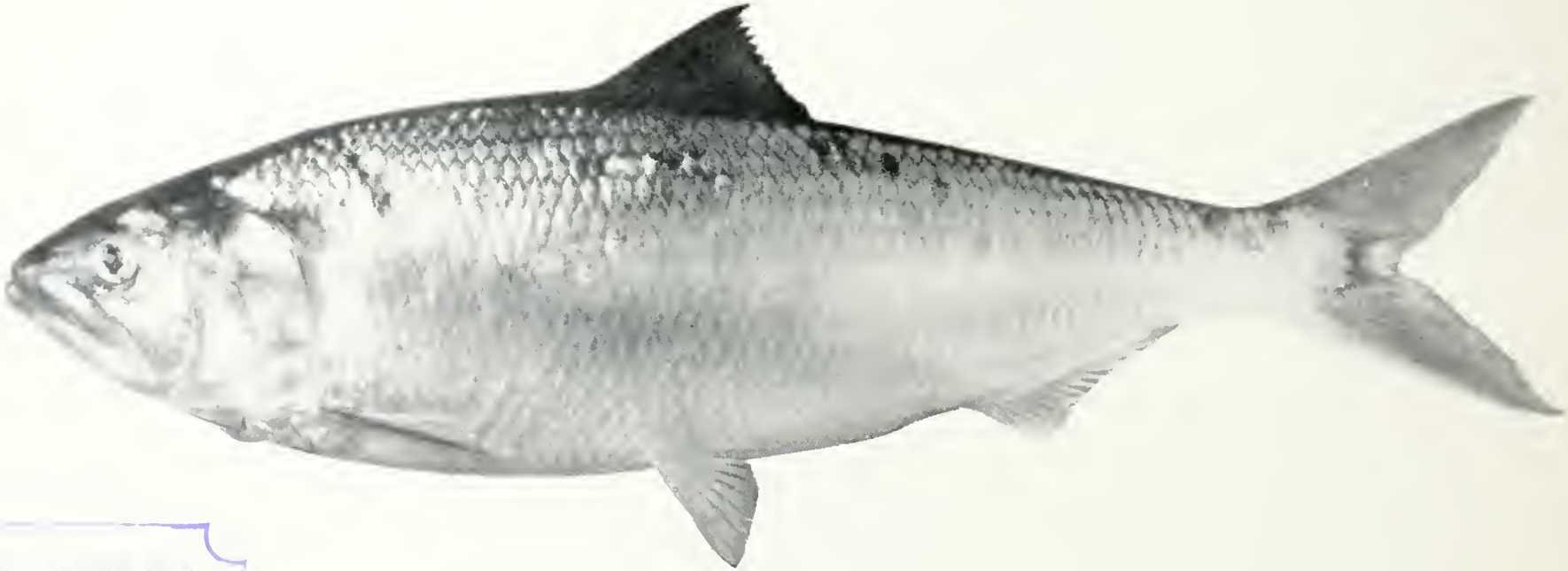


PLATE XI. Shad, *Alosa sapidissima.*

from each body of water, where and when taken, their disposition, and the name of the owner or lessee of such lands.

In addition to the rescue work, 1556 small-mouth black bass fry and eight adult bass were secured from the Salt Spring, Reservoir, Calaveras County, and placed in the Citrus Grove pond near Oroville as a propagating pond for that species of bass.

The one rescue of most importance to the sportsman angler was the rescue from Concow Creek, Butte County, below the dam, of 500 adult rainbow trout of four pounds each, 100 of three pounds, 1400 of two pounds and 435 yearlings, makings a total of 2435 trout, weighing approximately 5208 pounds. This was accomplished with the assistance of the local deputy, A. J. Stanley, fourteen volunteers from Oroville and Chico and the rescue force from Sacramento. The Bureau was aided by several market fishermen, who gave valuable assistance by the use of their large nets, boats and crews and in return were permitted to keep the rough fish, pike and hardheads, as there is very little, or no, demand for them except by the Chinese. These men, together with the volunteer sportsmen, were the means of saving 141,313 game fishes, nearly all of which were adults or breeders.

I trust that it is in order to thank all those farmers who allowed us the freedom of their lands and those who notified us of the necessity of saving many fish. Also, thanks are due to the chief of the Bureau of Fish Culture for making it possible for such wide distribution and prompt delivery by our distributing car and the skillful handling of the fish. Also to the many deputies who have given fine cooperation, both in assistance and by correspondence.

MEXICAN CABRILLA AND GROUPERS [1]

By Lionel A. Walford

Each year since 1927, during the late autumn, winter and spring months, an increasing number of large, unfamiliar seabass has been imported from south of California. Although there are at least four different but closely related kinds of these fish, they have so far all been reported to the Division of Fish and Game by dealers as "Cabrilla." The buying public, however, and retail marketmen are not always willing to experiment with strange, unknown fish, and it has been necessary for wholesalers to invent seductive names like *golden bass*. Since these excellent fish are deserving of more dignified treatment and need no apology in the form of sugar-coated names, this opportunity is taken of formally introducing them by their official common names: the *groupers* and the *Mexican cabrilla*.

The sea-bass family (Serranidae), to which these fish belong, is represented in California by four species: The black sea-bass (*Stereolepis gigas*), which resembles the groupers not only in shape and color, but also in the great size which it attains; and three smaller kinds, the rock bass, (*Paralabrax nebulifer*), the kelp bass (*Paralabrax clathratus*), and the spotted rock bass (*Paralabrax maculatofasciatus*) which looks like the cabrilla in color. On the Atlantic coast and on the Gulf of Mexico, the groupers, jew-fishes and hinds resemble very closely their Pacific coast relatives, and are esteemed not only as food but are famous as game fish.

[1]Contribution No. 105 from the California State Fisheries Laboratory August, 1930.

The sea-basses, an unspecialized group of fishes, are very difficult to describe for they have no clearly distinguishing characters. The ventral fins are attached below the pectoral fins; there is no bony support extending from the lower part of the eye across the cheek just under the skin; there are teeth in the center of the roof of the mouth; the dorsal fin is composed of spines as well as soft rays; the upper edge of the maxillary bone (the upper bone which forms the upper jaw) is exposed when the mouth is closed.

Of the Mexican forms which have been brought into California there are two types which may be easily recognized: One, the Mexican cabrilla, a closely spotted form comprising so far as we now know one species, *Epinephelus analogus;* the other type, the groupers, plain, dark-colored, obscurely or not at all spotted, including at least three species of the genus *Mycteroperca.* In this group, one species, the broom-tailed grouper (*Mycteroperca xenarcha*) can be readily distinguished by a toothed tail fin as contrasted to the even tail fins of the other species.

There are then these three names to apply to the large Mexican sea-bass: Mexican cabrilla, broom-tailed grouper, and grouper.

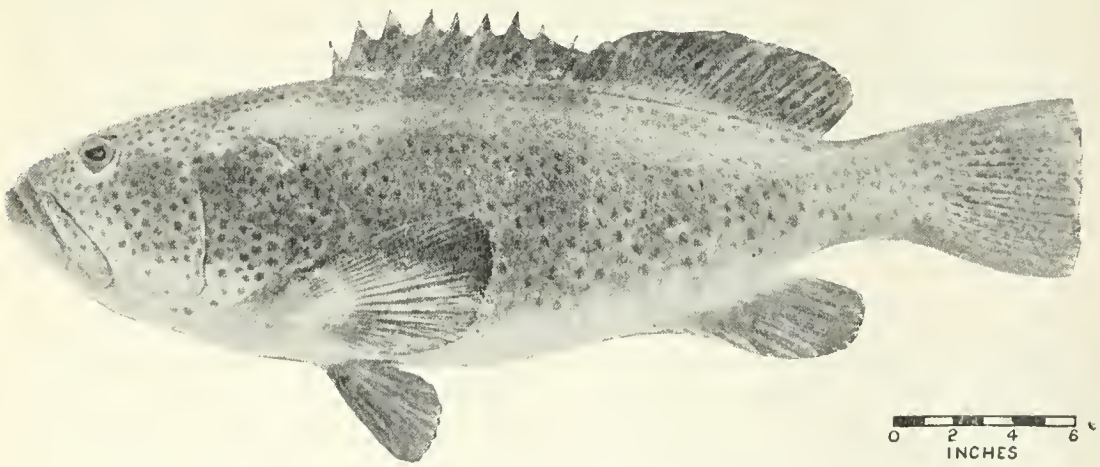


FIG. 10. The Mexican Cabrilla, *Epinephelus analogus.*

Mexican Cabrilla *(Epinephelus analogus)*

Distinguishing characters: The single dorsal fin, with usually 10 spines and from 16 to 18 soft rays; the spines being scarcely if at all higher than the soft rays, no one of them being noticeably higher than all of the rest; the anal fin having 3 spines and usually 8 soft rays; the teeth behind the outside row capable of being bent backwards. *Color*: Various shades of brown, the body being everywhere covered with small round dark spots; the sides with 5 or 6 faint dark cross-bars. Attains a weight of over 14 pounds. (See fig. 10.)



FIG. 11. The Spotted Rock Bass, *Paralabrax maculatofasciatus*, may at first glance be mistaken for the Mexican Cabrilla. (See Fig. 10.)

The spotted rock bass (see fig. 11), which is often taken in California waters, is a much smaller fish, and is easily distinguished from the Mexican cabrilla by the very high third spine of the dorsal fin, which is much over twice as high as the second spine, and higher than the fourth.

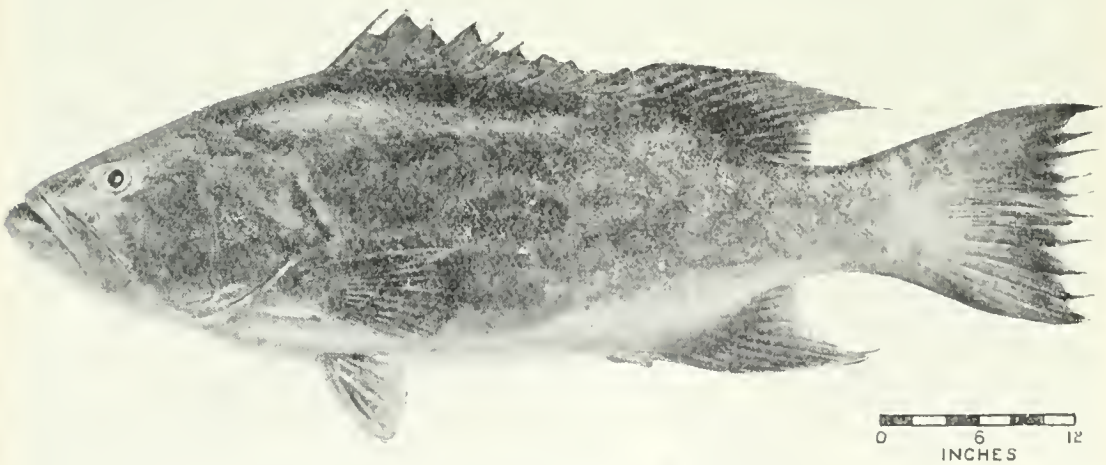


FIG. 12. The Broom-Tailed Grouper, *Mycteroperca xenarcha*.

Broom-Tailed Grouper *(Mycteroperca xenarcha)*

Distinguishing characters: The tenth soft ray of the dorsal fin, and the seventh soft ray of the anal fin are longer than the other rays, giving to the fins an angular appearance. In young specimens, the tail fin is perfectly even, but in older individuals, it becomes toothed as in the illustration (see fig. 12). *Color:* Light brown, the sides with obscure, large oval and oblong spots. Attains a weight of over 50 pounds.

GROUPER

Into this category may be placed those two or three species of sea-bass which have no distinguishing features on which to base quick identification. There is an absence of sharply contrasted color mark-

ings such as spots; the tail is perfectly even, not toothed; the soft part of the dorsal fin is rather even, not angular; the anal fin is highest in front. The color is brownish or grayish. These fish attain a weight of over 50 pounds.

If the trend of the total catch of these fishes continues to rise at the same rate as it has in the past few years, the cabrilla and groupers will become another great source of supply to our winter markets.

THE STATUS OF THE CANADA GOOSE IN CALIFORNIA

By James Moffitt

The Canada goose, known scientifically as *Branta canadensis canadensis,* is probably better known to the hunters of this state as the "Honker." It is the largest of all wild geese, individuals attaining a length of 43 inches from bill to tail tips and a wingspread of nearly six feet. The honker is exclusively a North American bird, not being known to occur in the wild on any other continent. It ranges over most of the United States and Canada and in winter occasionally visits Mexico.

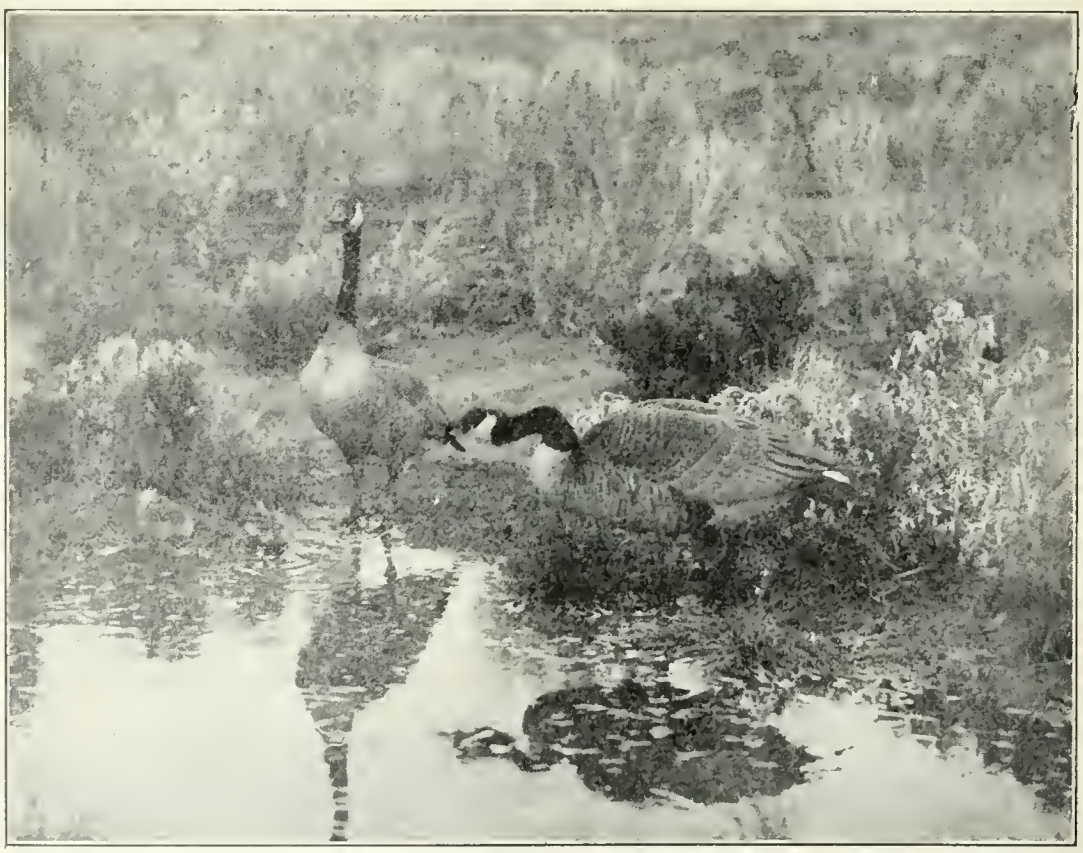


Fig. 13. A pair of Canada geese and their young. Lassen County, California. Photo by E. S. Cheney, May, 1929.

The Canada goose is the largest of a group or species of four geese inhabiting North America. The other three subspecies are: The white-cheeked goose (*Branta canadensis occidentalis*) breeding in southeastern Alaska, wintering little if any south of its breeding range and unknown from California; the Hutchins goose (*Branta canadensis hutchinsi*) breeding along the Arctic coast from northern Alaska east

to Baffin Land and wintering abundantly in California and the Mississippi delta region; and the Cackling goose (*Branta canadensis minima*), which breeds on the Bering Sea coast of Alaska and on the Aleutian Islands, it winters practically exclusively in the Sacramento and San Joaquin valleys of this state. There is little likelihood of a hunter confusing the Canada goose with the cackling goose or little brant which weighs no more than a mallard duck; but is marked similarly to the honker. However, the Hutchins goose or big brant more closely approximates the honker in size and I have often heard them erroneously called Canada geese by shooters.

The general coloration of the honker is so well known to most hunters that a description of its plumage seems unnecessary. However, certain plumage characteristics might be mentioned that serve to distinguish it from its smaller relative the Hutchins goose. The true Canada goose is usually very pale creamy buff, nearly white, on the breast and undersurface. This pale coloration beneath commences abruptly behind the black neck and continues to the belly where it merges into pure white. Hutchins geese are generally much darker grayish buff or gray beneath. There is no abrupt contrast between the black neck and grayish undersurface in this subspecies; but the black merges into the lighter colored under plumage, which continues further to the rear in this bird, where it abruptly meets the white of the belly. Size, voice, method of flight and habits will better serve to distinguish the honker from the big brant in the field, as these plumage characters are difficult to observe unless the bird is in hand.

There has been much speculation and I believe not a little exaggeration on the part of hunters regarding the weights attained by the Canada goose. I have personally weighed a number of Canada geese scaling twelve pounds and consider ten to twelve pounds the average for fat males and eight to ten pounds usual for well conditioned females. However, I have heard so many reliable hunters claim to have weighed Canada geese scaling sixteen or even eighteen pounds, I believe it probable that exceptionally large and old males attain this weight. I have heard claims running as high as twenty-one pounds, which certainly must be exaggerations when it is considered that a very large swan weighs about eighteen pounds. Hutchins geese only bulk about half the size of honkers. Old males weigh from five to six pounds and females from four to five. Their length varies from twenty-six to thirty-four inches while a honker is seldom less than thirty-six inches in length.

The voice of a honker is a full, slow, deep throated U-Lunk—Lunk—Lunk or Lonk—Wha-Lonk. The big brant calls at a much higher pitch and the notes are uttered more rapidly as: Lank-Lank-Lank or A-Lank-A-Lank.

Honkers fly with slow, measured wing beats and are generally to be found in rather small bands of say from six or ten to twenty or thirty birds; Hutchins geese more frequently travel in large flocks and fly with quicker wing beats. The longer neck of the Canada goose, together with its slow wing beats, when once seen, will forever serve to distinguish it from the shorter necked and quicker flapping big brant. When standing on the ground or at rest on the water the proportionately longer neck of the honker is also distinctive.

Canada geese nest further south than any of our other North American geese. Their breeding range extends from east central California eastward through Nevada, northern Utah and Colorado to Indiana, then northward through the interior of the continent to the lower Yukon Valley, Alaska, east along the northern limit of trees to Mackenzie and Keewatin territories of Canada, Labrador, Newfoundland and Gulf of St. Lawrence. Honkers breed commonly throughout the elevated lakes of Lassen and Modoc counties, California, in the vicinity of Lake Almanor, Plumas County, and south to Lake Tahoe, El Dorado County.

The writer is quite familiar with the occurrence of the Canada goose at Lake Tahoe where individuals seem to be present the year around. Whether the birds that breed there remain throughout the winter or migrate out in fall to be replaced by winter visitant birds from the north, is a question yet to be answered; but this would seem to be the

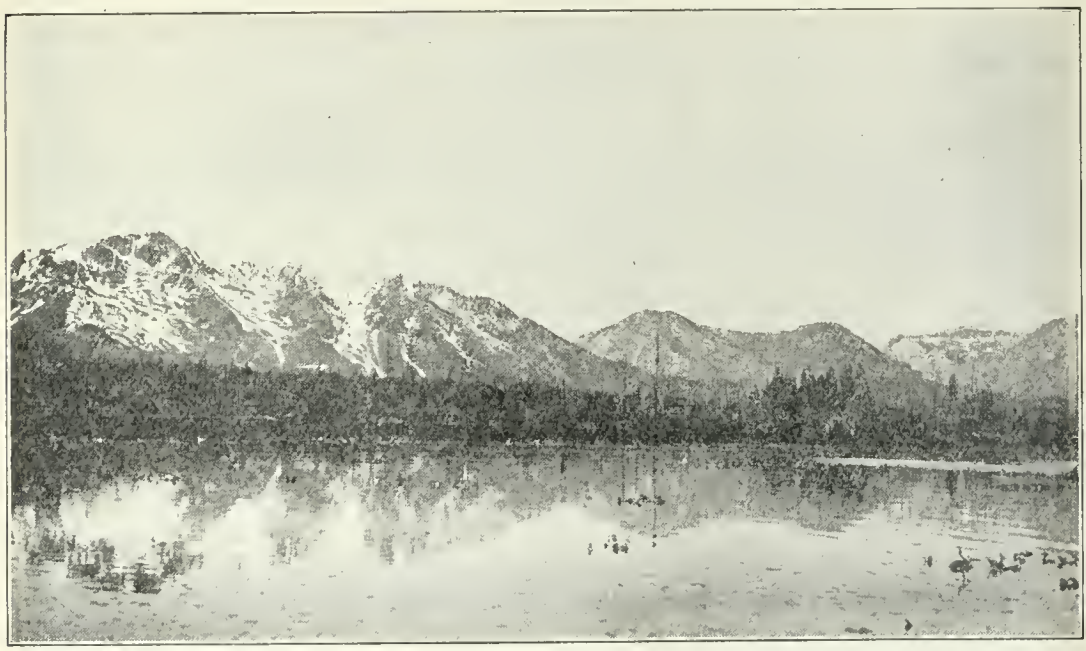


FIG. 14. Rowlands Marsh, Lake Tahoe, California. A nesting ground of the Canada goose. Photo by Author, May 30, 1920.

case. Honkers formerly bred on a small island in Emerald Bay, Lake Tahoe, but have long since deserted this spot. Now their only breeding ground in this region is the marsh situated at the extreme southern end of the lake between Tallac and Bijou.

The geese repair to this marsh to breed each spring arriving in late March or early April. If the swamp is still frozen over on their arrival they forage along the open sandy beach of the adjoining lake shore until the marsh thaws out. When the writer visited this marsh on April 21, 1927, it had thawed considerably, although the winter had been a heavy one, considerable open water existed and dead tule of the preceding season were standing in open water in spots, though most of the marsh was still covered with two feet of snow. Only one pair of Canada geese was noted, though others were undoubtedly present and nesting at this time, for on a latter visit to the same spot on May 15, five pair were seen and two small young ones, about a week old,

were caught on May 17. This indicates that eggs must have been deposited by April 10. The writer flushed a female from a late nest containing four fresh eggs on May 30, 1920. (See photo.) Ordinarily the honkers of Tahoe have large young by this date as is attested by one of the size of a mallard I captured there May 29, 1921.

Formerly inhabitants of the region collected numerous Canada goose eggs each spring which they hatched out under hens. It was told that in most cases the young were successfully and easily reared to become as tame as barnyard fowl. More active policing of this marsh in recent years has apparently stopped this practice and the geese are fortunately now unmolested by man during the breeding season. That other enemies occasionally account for some of them was indicated to me on June 4, 1923, when I found a nest containing six addled eggs of this goose with the remains of one of the parent birds six feet away,



FIG. 15. Nest of Canada goose, Rowlands Marsh, Lake Tahoe, California. Photo by Author, May 30, 1920.

devoured except for head, wings and tail. Scrutiny of dry mud surrounding the nest revealed old coyote tracks and solved the identity of the marauder.

The young of the Canada geese at Lake Tahoe begin to feather out and reach the "flapper" stage about July first. The adults then commence to loose their flight feathers, which are moulted all at once, rendering the birds flightless for a short interval. During this time the old birds and the young ones, which have not yet grown their wing quills, spend practically all the time either in or immediately adjacent to heavy tule patches, where they may readily hide and are almost impossible to apprehend. August finds both old and young gaining the power of flight and towards the latter part of this month the young

have lost all traces of the downy plumage and are fully feathered in the first true plumage. Subsequent to losing their flight feathers the old birds have a complete plumage moult and appear in an entire dress of new feathers by mid-September.

I am not certain whether the geese then move out to other feeding grounds or remain in the vicinity of the marsh. Certainly they do not immediately come west to the wintering grounds in the Sacramento and San Joaquin valleys, where they are unknown before November. However, an experience I had while deer hunting near Twin Peaks, Placer County, (just five miles west of Lake Tahoe) on September 1, 1918, leads me to believe the geese move to other feeding grounds about this time. I was then hunting at 9000 feet elevation in a thick fog or clouds, near the summit of the Sierran divide when I heard, not high overhead, the unmistakable notes of a flock of Canada geese. Certainly no geese, unless migrating, would have been flying so far from water at this elevation in such weather.

A visit to the marsh at Lake Tahoe, October 18, 1924, failed to reveal any geese. However, three were noted there on October 13, 1925, and twenty on October 23 of the same year, when one was shot. This increase in numbers as the season lengthend seems to indicate that the birds were working into the region, rather than to have been local bred birds. October 15, 1926, eight honkers were seen on this marsh.

I spent the winter of 1926 to 1927 at Lake Tahoe and only saw four Canada geese there the entire time. These were noted on the Truckee River, four mils below Lake Tahoe, January 4, 1927. Residents told me they were formerly quite common on this river, especially in very cold weather, where they sometimes remained a month. On January 1, 1928, I saw eight birds feeding on a grassy point in Lake Tahoe two miles north of Tahoe City. Residents claim the birds are often present along the lake shore all winter, feeding on the sandy beaches and points.

The Canada geese winter in a variety of localities throughout northern California and more sparingly at suitable points in southern California south to San Diego. Small lakes in the Sierran foothills or coast ranges are favorite wintering resorts for honkers from which they fly by day to adjoining fields to feed. Many are known to winter on East Park Reservoir, Colusa County, whence they forage west into the grain fields of that county. Two or three hundred of these birds ordinarily winter on the Spring Valley Lakes of San Mateo County, and every lake or reservoir of any size in northern California is a potential wintering ground for this bird if protection is afforded them. The honker is not abundant, in the sense that other geese are, in any part of its winter range, as it does not band up in such large aggregations, but prefers to scatter out over the country in smaller companies. In fact where other geese are most numerous, the Canada goose is usually found in fewest numbers. This applies to the great goose wintering grounds around Willows and Colusa and the Los Banos Country where white, white-fronted, hutchins and cackling geese are so numerous and honkers are usually conspicuous by their absence.

Probably the greatest wintering ground for honkers in this state is the territory south of Dixon and Davis in Salano and Yolo Counties to the Sacramento River and west to include the Suisun marsh region.

I am told a very large number of these birds winter northeast of Marysville towards the Sierran foothills. In the San Joaquin Valley the birds are fairly numerous, particularly on the extreme western side toward the coast ranges. A considerable number winters on Butte Creek in the vicinity of the Marysville Buttes. It is rare on San Francisco and San Pablo bays except at Tubbs Island, Sonoma County, where it is present each winter. The Canada goose is only an occasional visitor to salt water, and is rare on Tomales and Humboldt bays.

Although it breeds further south than any of our other North American geese, the Canada goose is the last species of goose to reach the wintering grounds in our state in the fall. It also winters at higher elevations than the other geese and seems able to withstand more cold

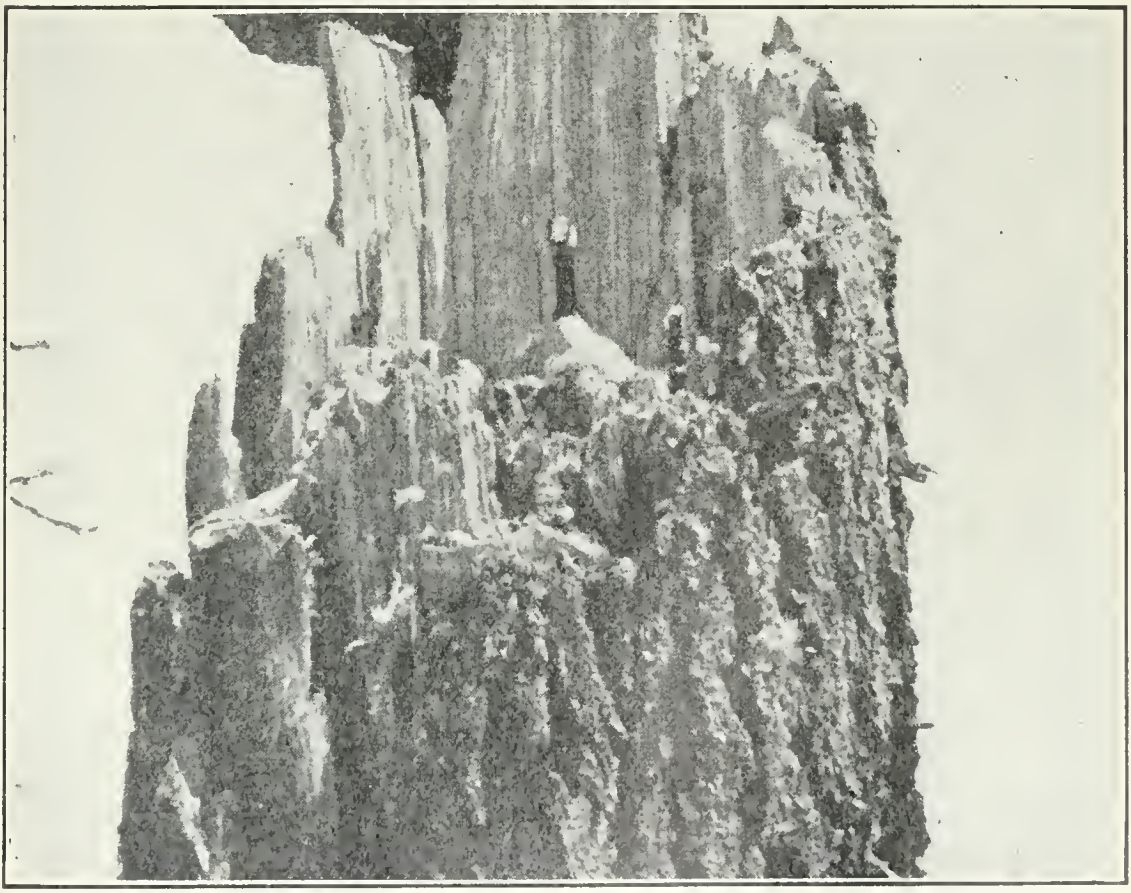


FIG. 16. Canada goose nesting on a snag, Lake Almanor, Plumas County, California. Enlargement from motion picture, "Geese of California." Photo by E. S. Cheney, May, 1929.

than its northerly breeding relatives. Lyman Belding, who made many careful notes on goose migrations in the Sacramento and San Joaquin valleys in the early "eighties," writes in his manuscript now preserved in the Bancroft Library of the University of California that the first honkers were noted near Stockton, November 11, 1880, November 23, 1881, and December 2, 1885. The earliest fall birds I have noted in central California was a flock of four that lit near my "speckled-belly" decoys, five miles southeast of Colusa on November 2, 1929. Howell Joseph, a Willows goose hunter and a thoroughly competent observer, told me he saw several Canada geese near Orland, Glenn County, on October 28, 1929. I saw my first honkers on Suisun Bay

the fall of 1929 on November 17, though Mr. H. H. Magee assured me he had seen a flock of over fifty birds there two weeks earlier. The first I have noted this fall (1930) on Suisun Bay were seen November 19, a flock of 20 birds.

The numbers of Canada geese wintering in our central valleys seem to vary considerably from year to year and their abundance here is apparently dependent upon the severity of the winter. For instance the winter of 1928 to 1929 was unusually cold and residents of Willows and Colusa assured me that more honkers were present in these districts that winter than for any of the preceding ten seasons. This assertion seems quite logical when it is recalled that many Canada geese spend the winter on our higher lakes, unless the weather be so severe as to freeze them up, when they must retreat to lower elevations.

In addition to being the latest arrivals in the fall the Canada geese are also the first geese to depart in the spring. The movement from the wintering to the breeding grounds may start as early as the latter part of February in central California and is in full swing throughout March. By the end of March most of the honkers have already left their winter ranges, while the Hutchins, cackling and white geese are fully a month later in migrating and the white-fronted or speckled-bellies do not leave until late April or early May. Belding noted a flock crossing the Sierras over Murphy's, Calaveras County, February 22, 1887. Mr. D. D. McLean saw the first easterly migrants crossing the Sierras over his home near Coulterville, Mariposa County, on April 4, 1921, and remarked that the birds were unusually late that season. The latest flock I have noted in the Sacramento Valley consisted of more than 200 birds seen along the Sacramento Valley west of West Butte, Sutter County, February 16, 1929.

The Canada goose suffered great decimation at the hands of market hunters in California prior to the passage of the Federal Migratory Bird Treaty Act in 1916 which prohibited the sale of waterfowl. Old time hunters tell of the great numbers of honkers to be seen "in the old days." However, on account of its more widespread winter habitat, less gregarious ways and extreme wariness, it is probable a much smaller percentage of Canada geese were killed than geese of the smaller varieties. From the end of November, when honkers have arrived at their winter quarters in numbers, until the end of the shooting season sufficient of these fine birds are now present in most parts of northern California to afford good sport to the hunter. However, in order to have any luck at all in hunting this goose the shooter must have a thorough knowledge of its habits, for it is probably the wariest of our waterfowl. Indeed, the expression "silly as a goose" is in no way applicable to the honker, or any other wild goose I have ever met, for that matter.

With the present bag limit on honkers at four birds a day and eight a week and thousands of acres of grain stubble available for winter feeding grounds, there seems little reason to fear that this fine bird will not continue to visit us in numbers each winter for a long time to come. The most vital need of the Canada goose in California at the present time is assurance that the lakes which form its breeding grounds in the northeastern part of this state be kept intact.

THE MOUNTAIN SHEEP OF CALIFORNIA

By E. H. Ober

Inyo County is bounded on the east by the Nevada line, on the west by the crest of the Sierra Nevada Mountains. For its southern boundaries it has Kern and San Bernardino, and to the north Mono County. Its latitude checks up with that of Virginia and Kentucky, and its area of 10,294 square miles makes it the second largest county of Cali-



Fig. 17. Supreme as rock-climbers, desert mountain sheep are at home on the highest crags and peaks. Photo by E. S. Cheney, Inyo Mountains, Inyo County, California, October, 1929.

fornia. The county can be spoken of as being somewhat unique. No other county in the United States presents such a varied surface in view of the fact of its having the highest peak, Mount Whitney, (14,502 feet elevation) and the lowest depression, Death Valley, (over 300 feet below the sea). Its surface is largely mountainous, interspersed with valleys, of which the Owens Valley is the largest, being over 100 miles long and in the northern portion 20 miles wide, and somewhat varying in width as one goes south, the Sierra here being impassable by wagon

or motor car. The valley is reached from the north or south only from California points.

The altitude of Owens Valley ranges from 3620 feet at Keeler, the southern end, to 4148 feet at Bishop, the northern end. Mount Whitney is, as has been stated, within the boundaries of Inyo County and many slightly less high neighboring summits afford scenic views scarcely less grand. Death Valley, one of the very lowest depressions in the United States is remarkable for the following facts: On each side of the valley mountains rise to an altitude of ten and eleven thousand feet, and a temperature of 120 degrees is not at all rare; people as a rule, and somewhat as a whole, are quick to accept the function of the valley as that of Creation's morgue and where desolation reigns supreme. However, north east, south and west of the main floor of the valley, and almost at its very heart, springs of pure cold water are to be found. This holds true throughout all of the mountain ranges bordering Death Valley. Furnace Creek ranch is located directly on the floor of the valley, and to the north comes Saline, Grapevine, Eureka, Cowhorn and Deep Springs valleys, and to the west Panamint Valley, all of which are located in Inyo County.

Writers of note have often referred to Inyo County as a sportsman's paradise, and have maintained that the Sierra Nevada mountains, particularly their frontage west of Owens Valley, together with those rare and silent mountains of Death Valley are, from a unique and scenic standpoint, unsurpassed by any other portion of the globe.

The county, as a whole, is extremely well supplied with game and game fish, and has the distinction of having within its boundaries 55 per cent of all the mountain sheep contained in California.

The origin of our American mountain sheep, it would seem highly probable, was by immigration from the Old World. The writer has given much time and thought to this subject and has found much evidence to substantiate this view. It would be quite reasonable to figure out that the North American sheep came in a roundabout way across Behring Straits' ice pack ages ago, and are really descendants of the Central Asia sheep, which are known as the Marco Polo and Argali, both of which roam the rugged mountains of western Mongolia. The two species are quite distinct, the Marco Polo is recognized by its wide spreading horns and the Argali by the large circumference of its horns at the base. According to Dr. W. T. Hornaday, as the sheep spread to the southward they produced the rather small Urial and Burrhel sheep, but that all stopped short at the northern edge of the superheated plains of India, while to the northward their fate was very different.

Continuing a little further regarding the sheep of the far north and their relationship, it would seem quite reasonable to presume that those of Alaska and those on farther north were the Marco Polo type, which would include the white sheep, *Ovis dalli* and the *Ovis fannini*, and the so-called black sheep, *Ovis stonei*. All can be distinguished by their wide spreading horns from tip to tip, and their comparatively small circumference measurement at the base of horns. Fifteen inches seems to be a fair size at base of horn for the black or stone sheep, and a tip to tip measurement of forty inches. Any white sheep around the Kenai peninsula, Alaska, can be considered to be a good specimen,

that measures thirteen or fourteen inches base measurement and a tip to tip measurement of twenty-eight or twenty-nine inches. Correspondingly all of the sheep that migrated to the south check up with the second species from the Old World, called *Ovis ammon,* which have large base horn measurements and small tip to tip measurements. Rocky Mountain sheep, in rare specimens, have measured seventeen inches at horn base with a tip to tip measurement of seventeen inches. The Argali sheep of Central Asia have in rare adult specimens a horn base measurement of nineteen or twenty inches. Those of the Marco Polo, in the same locality, have horn measurement at base of fifteen or fifteen-and-a-half, with a tip to tip measurement of thirty-nine or forty inches.

As has been said, North America contains seven or eight so-called species of mountain sheep, which we are told form two fairly distinct branches of the genus *Ovis.* The big horn of the Canadian Rockies forms the stem of the first, and from it branches the Nelson and Mexico sheep. The stem of the other branch is found in the black and white sheep of the far north.

To this writer it has always seemed strange that where the ranges of the big horn of the Canadian Rockies and the so-called "black sheep" came together, the so-called Fannins sheep seem only as a form standing between the white and black so-called species. The white sheep, however, have an immense range, covering half of Alaska and practically the whole Yukon territory, as has also the Mexico sheep, which can be found in many mountain ranges throughout Mexico, including the mountains in the immediate vicinity of Santa Maria Lakes in Chihuahua, and southward to the lower end of the Lower California peninsula.

From northern British Columbia and Alaska to northern Mexico there was formerly a practically unbroken range of mountain sheep for 3600 miles. Scientists have reported finding several species of mountain sheep in this broken range, all of which have been described since 1883. Of all the so-called species only three or four are sufficiently interesting to observe separate mention in this paper. The first, the largest and most widely known of these sheep in America, is the big horn of the Canadian Rockies, known to science as *Ovis canadensis.* The writer has always thought, and still believes, that the so-called Nelson Death Valley sheep (*Ovis nelsoni*), including also the "Mexico sheep" (*Ovis mexicanus*) are really the variants of the big horn sheep from the Rockies, as it is very reasonable to presume that in the long span of years this stock migrated from the Canadian Rockies as far south as the northern states of Mexico. But as they came south, various climatic and geographic conditions were met. As a matter of fact the environments of the localities where the sheep have made their homes for years have necessarily had all to do with their size and form. This fact is particularly exemplified in the Death Valley sheep.

It seems reasonable to believe that all of the sheep which migrated to the south, including Death Valley and Mexican sheep, are the same, under geographic changes. We must also note that the three sheep look alike, comparatively speaking; all have large horns at base measurements, and above all rather narrow horns from tip to tip; all have about the same build of body and the peculiar white or cream

patch on the hind quarters completely surrounding the short tail. The Rocky Mountain sheep will, of course, always outmeasure the Death Valley or Mexican sheep when the tape is used. This is due, I am sure, to different food and water conditions embracing their chosen habitats.

There are numbers of Death Valley and Nevada, or Mexican, sheep that can compare favorably in horn measurements with the Canadian Rocky Mountain sheep. A big horn of the north can be considered good that will measure 16½ inches basal circumference. That measurement would be practically the maximum for California or Mexican sheep. I have heard, from time to time, all sorts of stories concerning 17 or 18 inch horn measurements for California or Mexican sheep, but they are few and far between. I doubt very much if there can be produced, living or dead, a California sheep with horns which will measure 18¼ inches at base of skull, particularly if the horns are one

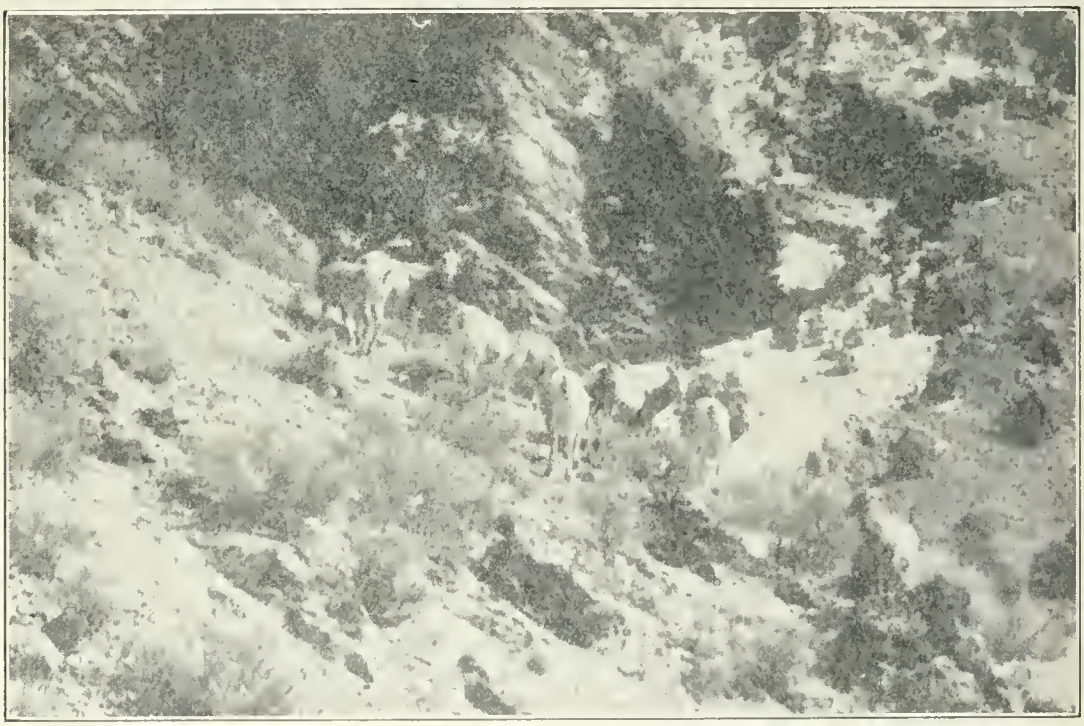


FIG. 18. Mountain sheep ascend and descend the steepest canyons, crossing with ease the most perilous passes. Here a group of ewes with young are entering a steep canyon. White Mountains, Inyo County, California. Photo by Robert Symons, March 21, 1930.

or more years old. It must be remembered that all sheep horns shrink in circumference with age. A large horn will, in two years drying, shrink nearly an inch in basal circumference and there seems no way to prevent it in a mounted specimen. The largest mountain sheep horns contained in North America come from British Columbia and southwestern Alberta and are from the true Rocky Mountain big horn, now *Ovis canadensis,* but for nearly ninety years called *Ovis montana.* A record head of any big game animal is not necessarily the largest head that can be found; usually it is an impossibility to find the finest head of any given species. So many qualities enter in for judgment that it is almost impossible for any one specimen to combine all of them.

I have read with interest the published report by Allen (1912) which deals with the nomenclature of the North American mountain sheep. He revives the old name *Ovis californianus* of Douglas for a hypothetical race "formerly inhabiting" the "Cascade Mountains of southern Washington and Oregon and Mount Shasta and the mountainous country to the eastward in northern California" and "now probably extinct." He establishes "Mount Adams, Yakima County, Washington," as the type locality of *Ovis cervina californiana.*

Joseph Grinnell (1912) in his report on "The Big Horn of the Sierra Nevada" says "The existence of the distinct race, with the above range, for which the name *californiana* is useable, is suggested by Allen, thus wholly on geographical grounds." On the same grounds Grinnell would point out the probability of the former existence of

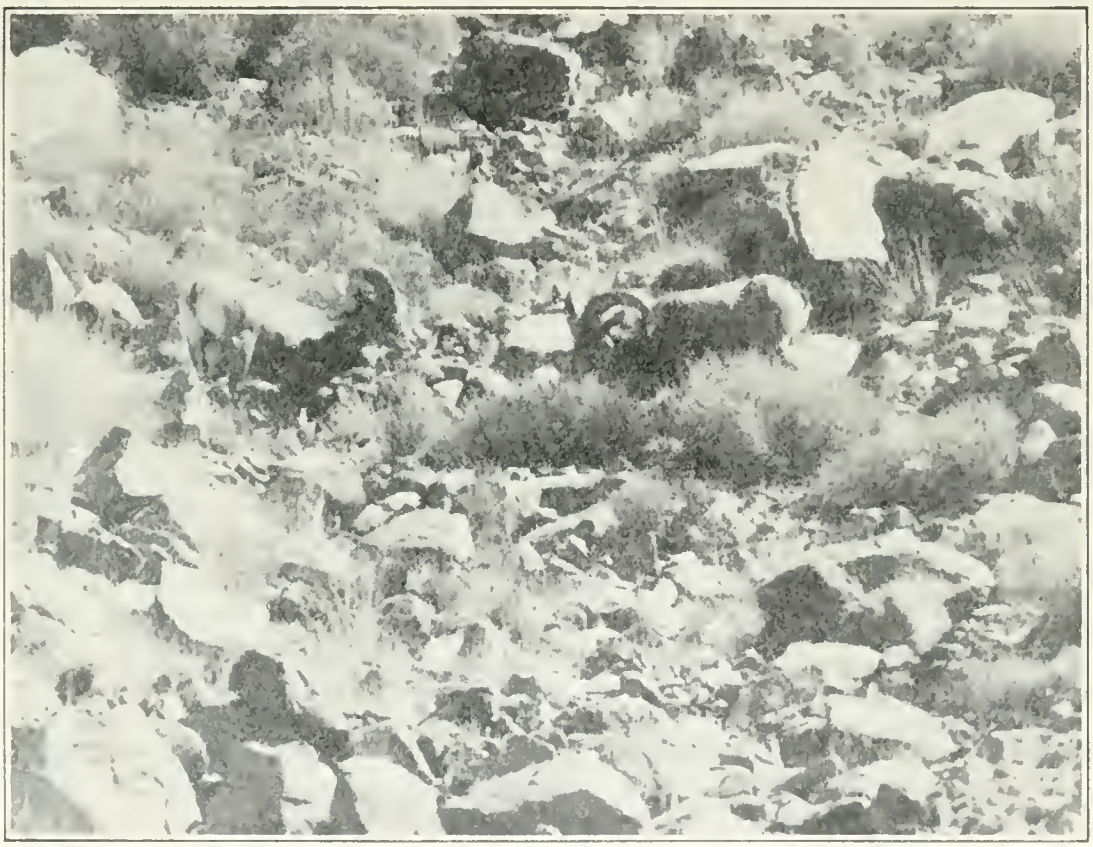


FIG. 19. When motionless, desert mountain sheep are difficult to discover. Inyo Mountains, Inyo County. Photo by E. S. Cheney, October, 1929.

separate races in the Cascades and in the Sierra Nevada. He claims it would appear illogical to assume that the Sierra Nevada form is identical with that of Washington. To this writer, also, it would seem quite logical to assume that the sheep described by Allen from Washington came perhaps as far south as Mount Shasta, but no farther. The sheep described by Grinnell from the Sierra Nevada Mountains differ from those from the Panamint Range of mountains bordering Death Valley. The Sierra sheep are, quite naturally, considerably lighter in color than the desert form, due to geographic conditions.

Old timers maintain that before the advent of the white man in Owens Valley mountain sheep crossed and recrossed Owens Valley

from the Death Valley ranges to the Sierra in several places south of Big Pine. As time rolled on the progress of civilization and the works of man in the valley seemed to check these migrations. For the past sixty years I have never heard of a mountain sheep making the crossing. Not so, however, with our mule deer. To this day the deer perform, as of old, crossing at various points throughout Owens Valley during the late fall, and recrossing to the Sierra in the early spring. Of late years, however, many deer have wintered in the lower portions of the Sierra, west of the Owens Valley proper.

The difference in form of the Sierra and Desert Mountain sheep is due to their environment. The Sierra sheep hug the snow line at all times of the year, and as a consequence have been supplied by nature with a heavy pelage. These high Sierra sheep perhaps have never migrated further to the north than Mount Ritter or Banner. They have reared their young as best they could and now their numbers have reached about two hundred head. Scattered locally, their range extends from Convict Lakes Mountains, Mono County, to northeastern Kern County. Mount Tom, directly west of Round Valley particularly the eastern slope, holds upwards of thirty-five head at all times of the year. Most of the others are found around Mount Baxter saw mill and Oak Creek passes west of Independence, Inyo County. The crest of the Sierra Nevada Mountains thus forms the Western boundary of the present range of the mountain sheep in California.

Mount Montgomery, in the White Mountains, forms the northern boundary of the Desert Mountain sheep. This variety can be found here and there southward throughout the White Mountains. They may almost always be found around White Mountain Peak and its immediate vicinity to the north, and Deep Springs Home Stake Canyon, Piute Monument, Beverage Mountains, Wacoba Mountain, Lead Canyon, head of Willow Creek, Saline Valley Mountains and on down as far as Cerro Gordo to the south. They range to the east in nearly every mountain range throughout the Death Valley Section to the Nevada line.

In southern California, Mount Baldy and Cucamonga Peak have small remnant herds and Old Grayback Mountain, it may be said, contains just a small number over the remnant stage. The San Jacinto Mountains contain sheep west of Palm Springs and around what is known as Borago Valley sections, and to the south sparingly in the range to Campo, on the Mexican line. The mountains to the east and north of Imperial Valley, together with those of Riverside and San Bernardino counties, east to the Colorado River contain mountain sheep in the remote and extreme sections. San Bernardino County has the distinction of having, in the mountains to the north and east, the second largest number of mountain sheep in California.

If all of the mountain sheep contained in California could be gathered together and a careful and accurate check could be made on their numbers, I am of the honest opinion such would not reach 3,000 head, as it must be understood that sheep are few and very much scattered throughout the mountain ranges, regardless of the statements of those who claim thousands of sheep for California. Such statements usually come from people who are not accurately informed and who are usually ever ready to jump at conclusions.

There seems to be now just about as many mountain sheep in California as there were thirty or forty years ago, and in the opinion of this writer, their numbers will continue to be about the same from year to year.

No wild animal other than the mountain sheep has circling horns. Large rams are readily recognized by their massive round, curving horns, which in profile describe from one-half to three-fourths, or more, of a circle, and which are never shed. The ewes have horns which are erect and flat and usually about nine or ten inches long on adult specimens. Mountain sheep do little migrating from rough and steep sections to lower or rolling hills, contenting themselves with the higher elevations no matter what the weather conditions may be. However, Death Valley sheep are known to have crossed Owens Valley and

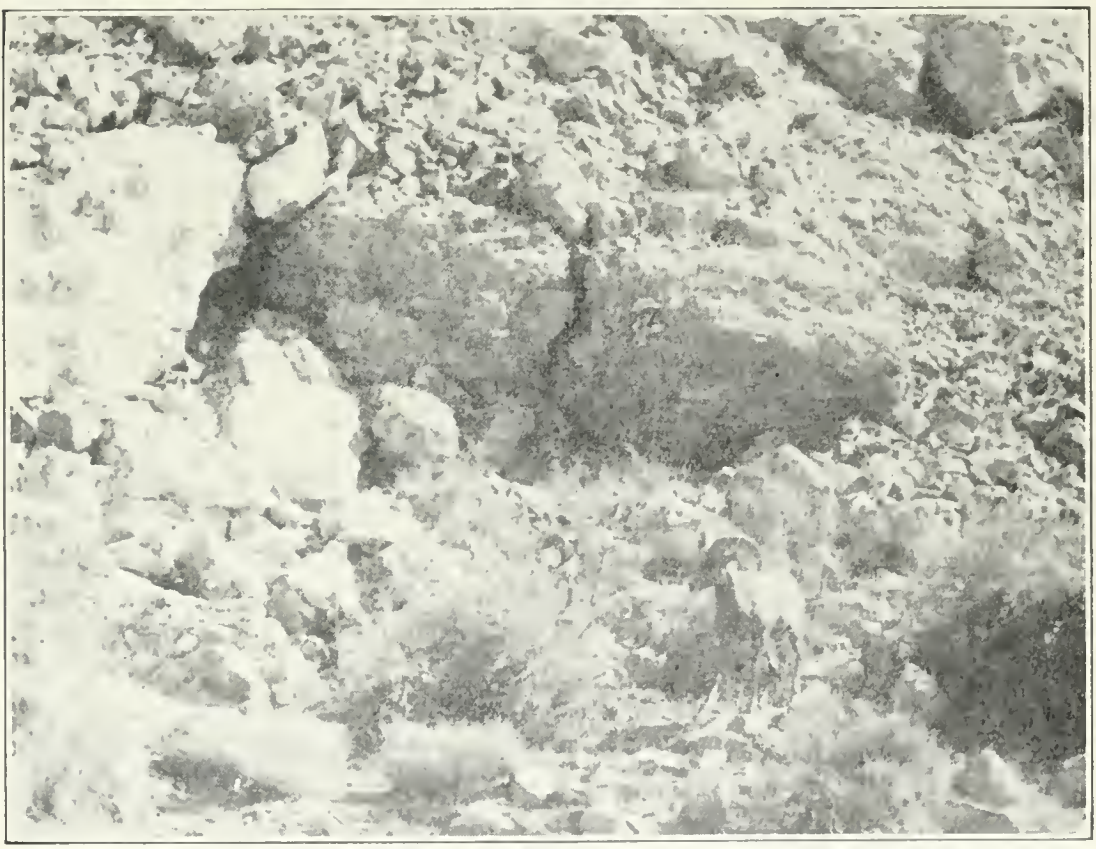


FIG. 20. Desert mountain sheep travel through inaccessible country with wonderful reserve of strength. Inyo Mountains, Inyo County. Photo by E. S. Cheney.

others of the state sometimes cross other valleys from one range to another. The ram mountain sheep is, as a rule, much darker in color than the ewe. The average life of a mountain sheep reaches about seventeen years. Their age is reckoned by their teeth, and their span of life is determined by their range conditions. Their round, thick, and comparatively short body is covered with practically the same pelage as that of a mule deer. Some writers and nature fakirs have given the public the impression that wild mountain sheep are covered with wool, which is quite wrong. The hide of a mountain sheep in no way whatever resembles the wool pelt of the domestic sheep. Mountain sheep are very much like the domestic sheep in their feeding habits, but must not be confused as being similar in any other way.

These animals, like deer, gather in large herds during their rutting season. In California rutting season begins in October and sometimes lasts over into November. As soon as this season is over the sheep disband, the large rams scatter everywhere, and the ewes, yearlings, and the two and three year old sheep remain in bunches throughout their respective ranges.

Large rams, in the rutting season, indulge in some great combats. Two rival rams will usually choose, as near as possible, a level spot, back off ten or twelve feet from each other then come together with the impact of a heavy sledge hammer. The force of the collision sometimes throws both sheep upright on their hind legs. The combat never lasts very long, two or three lunges as a rule ends the fight. While I have never witnessed a complete "knockout," I have seen on two occasions "technical knockouts." The loser usually runs away at top speed after he has given up the battle. Rams never break their horn tips in fighting, as many sportsmen and naturalists have hastily concluded they do. Coming together head on, it would be a physical impossibility for the tips to be harmed. Nearly all of the older rams of Death Valley, and California desert mountain regions have the ends of their horns broken off. This is due to their use as prys among the rocks while they are in search of certain succulent bulbs and roots eaten during the seasons of drought, a favorite is desert or matilija poppy roots, which are greatly sought after by the sheep in all of the Death Valley mountains.

Likewise, all of the desert mountain sheep ewes have more or less tender feet (if observed when not alarmed) due to their digging for bulbs. Apparently this food seems to serve as a thirst quencher until rain falls and the various remote springs are replenished. The Sierra mountain sheep, on the other hand, never have broken horn tips except by accident. They have at all times abundance of water and forage, and do not find it necessary to use their horns for prying rocks to unearth succulent roots.

Mountain sheep seldom come to water where green feed is in evidence. In all of the desert mountain ranges in the very hottest and driest months, (which are usually July, August and September) sheep come, if possible, to water twice a week, and sometimes more often, if not alarmed at their accustomed watering place. This habit depends, of course, on conditions and circumstances. Sheep can and do go a long time without water if necessary. The animals are very apt in securing and eating roots yielding moisture. They perform their longest migration when pressed too far by thirst. Sometimes they are so famished for water that they will come in to the water holes, drop on their knees when necessary, and drink for a minute or so without once looking up. Their usual custom, however, in drinking is to look up carefully and quickly every few seconds, their thought being, perhaps, to survey their immediate surroundings for protective purposes.

Lambs of mountain sheep never come to water during the entire nursing period, which runs usually about four or five months. They are generally left high up on the mountain side, and their colors blend so perfectly with the rocks that it is like looking for a needle in a haystack to find them. The lambs while in their hidden position are nearly

motionless and extremely quiet until the return of their mothers from their upward and outward routes to their feeding and resting places.

There are watering places for mountain sheep in numerous localities throughout all of the desert ranges. A knowledge of these sometimes affords occasional unscrupulous and contemptible hunters the opportunity to lie in wait and indulge in indiscriminate killing. This is a very old custom and there seems to be every indication that the habit will continue in the future. In view of the tremendously large and remote areas over which these animals range, there are perhaps a thousand places where sheep can come to water and where killing can be indulged in. It is hoped that more of such law breakers will be apprehended and brought to justice, for they are depleting the number of our mountain sheep throughout the desert mountain ranges.

Mountain sheep are very playful, particularly the lambs and young rams and ewes. It is truly a great sight to see a herd of them, when in no way alarmed or suspicious, at play.

Bold and somewhat reckless climbers, they are capable of feats that really are astonishing. However, mountain sheep can not, and never did, or never will, alight upon their horns. When pressed or pursued they perform almost miraculous climbs, jumping here and there as they traverse the rocky ledges, always coming out all right, when to the observer it would seem certain that they would be dashed to death.

The young of all mountain sheep in California are born in May and June, and almost always two in number. The mothers, if possible, always pick out the most dangerous and inaccessible crags and precipices imaginable. Their idea, no doubt, is to have their offspring far beyond the reach of foes (other than the golden eagle). Another reason, I imagine, is to teach the young the first rudiments of negotiating steep and rough country. The lambs remain where born for a few days, or until such time as the degrees and variations of the mountainside have been properly figured out for mastery. The mothers with their young are exceedingly alert and watchful at all times. From their usually safe positions they can detect the coming of man or other enemy. All mountain sheep have one bad fault, that of curiosity, which holds them too long when approached by man. Once alarmed, however, they can disappear like magic over the points of the prominences they have been occupying. By the time the human reaches the spot where the sheep was standing the animal is usually out of sight.

The lambs of mountain sheep are able, at a very tender age, strange as it may seem, to follow their mothers down and through the very steepest cliffs and roughest country without the least difficulty.

When mountain sheep have been fired upon in steep or rough country and are once thoroughly alarmed, they will leave such sections and will go until other rough and steep country is found, whether it be two miles or twenty. All mountain sheep seem to thrive equally well under varied conditions. This is due wholly from their feeding on every growing plant and bush found in their domain. The usual conception of wild mountain sheep being inhabitants of the clear cold upper world is exactly right and justified, particularly in the case of the Rocky Mountain, Alaska or Sierra sheep, for in late spring or early autumn they seek the rugged high elevations where they remain

until the heavy winter snows drive them down to open and lower uplands.

Death Valley sheep thrive practically all winter, from top to bottom of the desert mountain ranges where they seem to be perfectly at home amid the cactus, yuccas, and other thorny vegetation where water is extremely scarce, and where the midsummer heat rises about 110 degrees Fahrenheit in the shade. The sheep seek, in the heat of the summer days, the sheer cliffs, and lie at their base, and venture out to feed very late in the afternoon and at daybreak. Old desert mountain sheep often can hardly hear a sound, owing to their very small ears being cemented up with desert ticks which start from the time of their birth. Their sight and scent, however, are exceptionally keen. In the spring and early summer, when the grasses and wild flowers are in profusion throughout the desert mountains, sheep travel but little.



FIG. 21. A fine picture of alertness is presented by this band of ewes with young of previous spring. White Mountains, Inyo County, California. Photo by Robert Symons, March 21, 1930.

As soon, however, as the green feed begins to dry, these animals are constantly on the move, going down over canyon and up another desert mountain. Sheep often go twenty miles for water then feed back to where they started.

The weight of an average California mountain sheep ram, depending on its condition, seldom goes over 140 pounds dressed. The head and horns on a large specimen runs about 31 or 32 pounds. The ewes are very much smaller in proportion. The writer has had much to do with weighing and measuring California sheep specimens. He has from time to time been collecting for scientific research. Under his supervision was collected the group of Death Valley mountain sheep which filled the gap of North America mammals now on exhibition in the Bronx Museum, New York.

The hoofs of mountain sheep are excellent for use as brakes in descending inclines that are very steep and smooth, and likewise for clinging in very steep and high country. They are somewhat long and narrow, hollow cupped, with sharp edges, and fitted inside, near the heel, with a soft, rubber-like substance, all of which seems to have been provided by nature for the convenience of these rare and elusive animals. Their form and shape in all their respective domains are the same. Those of all desert mountains are of a light steel gray and those of the Sierra Nevada mountains are of a very light pearl gray. Their eyes are not black in color, as recounted by some writers, but are dark yellow in hue, with the iris a straw color, a shade darker than Naples yellow.

There has been no open season on mountain sheep in California since 1883. To open a season would, in the opinion of this writer, be nothing less than a crime, and would be, and prove a step in the wrong direction. There are no men or set of men in California today who in or by any manner could particularly increase the supply of mountain sheep sufficiently for an open season. Taxidermists and perhaps others equally interested may take issue with these statements; nevertheless, such are the bare facts surrounding this situation.

Many factors govern the decrease or increase of California mountain sheep far beyond the control of man. These animals have a tremendously large mountain area to roam over which harbors many natural enemies. Always they are combating the destructive golden eagle. This large bird frequents all of the mountain sheep territory in California. The writer, after a lifetime of study and protection of the birds and animals of California's great resort region, has had the privilege of witnessing many strange and unexpected happenings which are seldom seen, but are part and parcel of events that fill the lives of nature's denizens of the desert. The most thrilling and interesting, in my opinion, was my presence in a "ringside" seat among the pinnacles of the Grape Vine mountains of Death Valley, there to witness the following drama of the wilds.

After a morning spent in reaching the summit of the range where a band of mountain sheep had been sighted the day before, we found "signs" and started stalking our game carefully, finally jumping and killing a fine large ram. My party was engaged at the time in securing specimens of the desert mountain sheep (*Ovis nelsoni*) for the great naturalist, Dr. Hornaday. The ram, along with a female sheep, were later placed in the Bronx Museum in New York, as above mentioned.

At the firing of our few shots, the rest of the band of sheep promptly scattered, jumping and running over trails that a man would not care to walk carefully over. One yearling sheep, confused and a bit inquisitive, became separated from the bunch and circled back and up toward where we were preparing our kill for transportation to camp. Sitting motionless we allowed the sheep to get within fifty yards of our position before he became aware of our presence. Upon sighting our party of three he wheeled and began a mad flight down the long sandy draw in which we had made our kill. Suddenly out of the sky came a thunderbolt of dark hue, the wind hissing through its wings; it shot straight down to deal the yearling a resounding blow

on the back. The sheep staggered by the blow kept gamely on. The golden eagle soared up for another attack, while its mate struck the yearling. Four times each great bird zoomed and struck, always in the same place. The sheep, badly wounded by the attacks, was plainly weakening. The final act came when the largest of the birds, the male, flew ahead of the sheep and alighting on the rocks in front of the animal beat its wings and screamed repeatedly in an effort to head the sheep off. The yearling, awed by the terrible figure of the killer, paused to seek a new exit; that pause was its doom. Straight and as fast as a bullet came the female bird, striking this time at an angle in order to get the sheep to fall. The angle was perfect, and the blow so hard that the badly weakened sheep fell sprawling down the draw. Both eagles pounced on the carcass, tearing madly at the choicer parts of the anatomy. Upon close examination we found that the killing

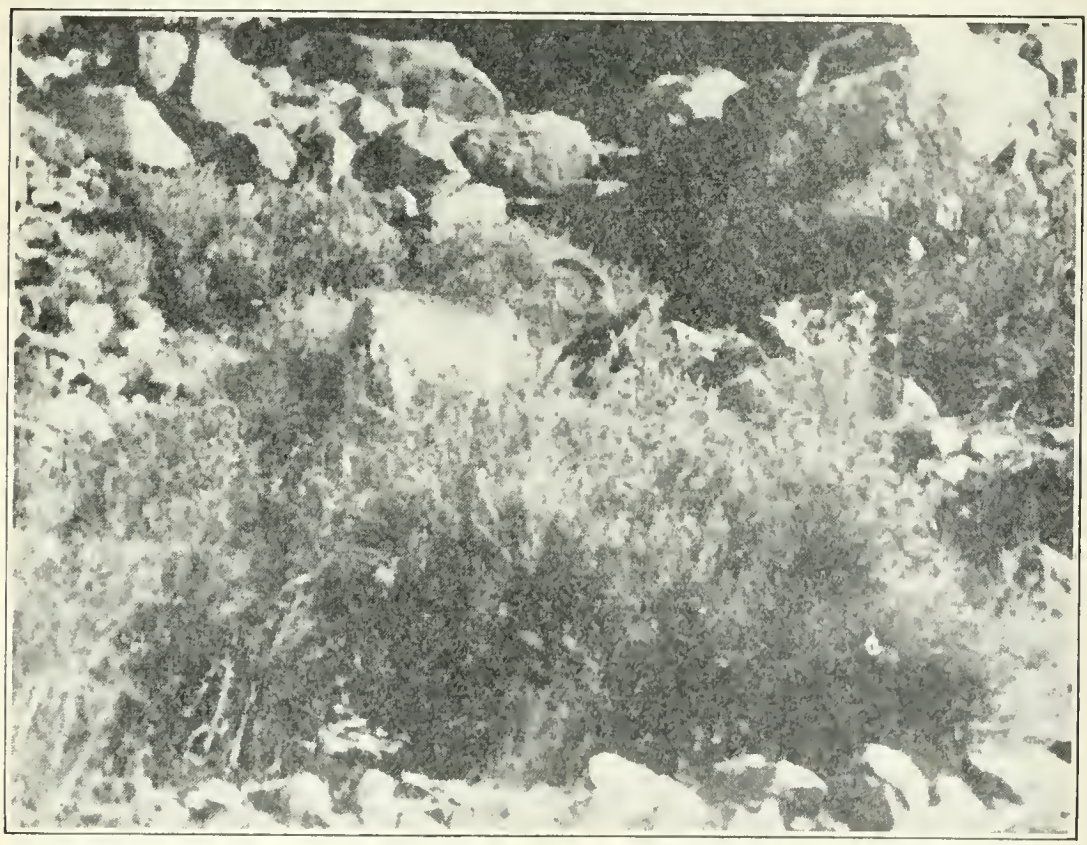


FIG. 22. Desert mountain sheep find nourishment in the sparse vegetation near the summit of desert mountains. They are partial to browse off various succulent bulbs and roots. Photo by E. S. Cheney.

blows were innumerable punctures by the birds sharp talons into the back over the kidneys, the sheep bleeding internally, scarcely a drop of blood being visible on the outside. In all my experience with the wild life of this section I have never witnessed such remarkable teamwork or such a parallel to human intelligence in making a kill.

Mountain sheep lambs are born late in May and early June, and at the very time young eagles are in the nest. The parent birds are wonderfully active in supplying their young eaglets with food, and unfortunately their favorite delicacy seems to be the young lambs of mountain sheep. The writer, in November, 1922, in company with two witnesses, discovered three golden eagles' nests in the Death Valley

and Panamint ranges. Upon careful investigation of the nests, their structure, position and locality, there were discovered five small mountain sheep lamb skulls, together with various other bones of desert rodents.

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CALIFORNIA SEAWEEDS

By Paul Bonnot

The coast of California is rough and rocky, and the littoral zone, from a depth of ten fathoms to the level of high water, supports a rich marine flora. The larger forms of algae (kelp) are found in the deeper water, while in shallow water and between tide levels are the smaller forms (seaweed). The larger kelps are not numerous as to individual species, but they more than make up for this by forming vast beds, hundreds of square miles in area. Most of the seaweeds are not individually numerous but there are so many species that the rocks, uncovered at low water, can scarcely be seen through the dense growths they support.



Fig. 23. Carrying seaweed from the rocks to the drying fields on top of the bluffs. Chinese camp about five miles below Pigeon Point. Porphyra growing on the rock in the foreground. Photo by Paul Bonnot, May 17, 1929.

Very little commercial use has ever been made of this abundance of marine vegetation. California is a comparatively new country and there are many natural resources more easily exploited. During the World War there was flurry of activity in the utilization of the kelps. Products such as potash and iodine which had been previously imported, were not available. Baleh (1902) discovered that the kelps were high in potassium salts, so that, with the foreign supply cut off experiments were begun on a large scale to determine the usability of the kelps. While the war lasted several concerns under government subsidy, harvested great quantities of kelp and produced the needed

chemicals, but with the end of the war the business gradually declined. It was found that on a peace time basis the cost of production was prohibitive. However several efficient methods of production were worked out during this period and the kelp beds remain, at least a potential source of several necessary commodities awaiting cheaper methods of utilization, or the press of future necessity. At the present time there are two concerns using kelp in California. One of these produces chemicals and fertilizer, the other produces products which are marketed for human consumption, for stock feed and for fertilizer.



FIG. 24. Yuen Bon, collector of seaweed (*Porphyra*) at Pescadero. The seaweed is brought up to the drying place in the baskets and shoulder pole. Photo by Paul Bonnot, May, 1929.

Only four species of kelp have been used commercially in California. These four species are abundant, available and contain a high percentage of potassium. They are: *Macrocystis pyrifera, Nereocystis luetkeana, Pelagophycus porra* and *Alaria fistulosa. Macrocystis* and *Pelagophycus* are found from Point Sur southward. *Nereocystis* and *Alaria* occur from Point Sur northward. During the war the Macrocystis furnished the largest tonnage as it is the most abundant of the kelps. It is a perennial and grows rapidly. It can be cut four times a year without injury to the beds. It has been estimated that from Point Concepcion to the Mexican boundary there are approximately one hundred square miles of kelp beds which would yield, with two cuttings. 18,000,000 tons of wet kelp per year.

Agar agar is imported from Japan to the United States in large quantities. It is used extensively as a culture medium in bacteriological work, for sizing cloth and to make candy and fancy jellies. The



FIG. 25. An Indian camp on the highway a mile below Albion. Seaweed (*Porphyra)* drying in the sun. Photo by Paul Bonnot.

Japanese agar is made from various species of *Gelidium, Graciliara* and *Eucheuma.* There are eight species of algae from which the Japanese can produce agar. On the coast of southern California there are fifteen species of algae which are suitable for the manufacture of agar. Some of these would no doubt furnish an inferior article, but several are identical with the Japanese species. There is at present one company in California producing agar from local and imported seaweed. They are marketing, besides the commercial agar, jellies, breakfast foods and candies.

As a food for human consumption seaweeds have long been in use in various parts of the world. The Chinese and Japanese are the principal users today. In Japan, where an increasing population runs a continually losing race with the food supply, various forms of algae are cultivated. The Chinese use a great deal of seaweed and for the last forty years have gathered seaweed on the California coast for

export to China. The only local seaweed utilized directly as human food to-day is *Porphyra perforata*. This species is found on the Pacific coast from the state of Washington to Mexico. It grows on the rocks to the limit of high water. It is an annual, the young plants appearing before the old ones die. After the heavy winter storms only a few specimens can be found in the most sheltered places. With the arrival of spring and more congenial weather it quickly spreads and by April it covers the rocks in favorable places in dense mats. It furnishes food for the abalone (*Haliotis*) and for the sea slug (*Lacuna*). The sea slugs eat holes in the fronds which are responsible for the specific name. Porphyra reproduces both sexually and asexually. By the asexual method a spore (monospore) is produced by a thallus cell. In the sexual phase the egg after being fertilized divides into four spores (carpospores) which are thrown off in the same manner as the asexual spore. None of these reproductive units are ciliated, but the monospore and sperm are slightly amoeboid.

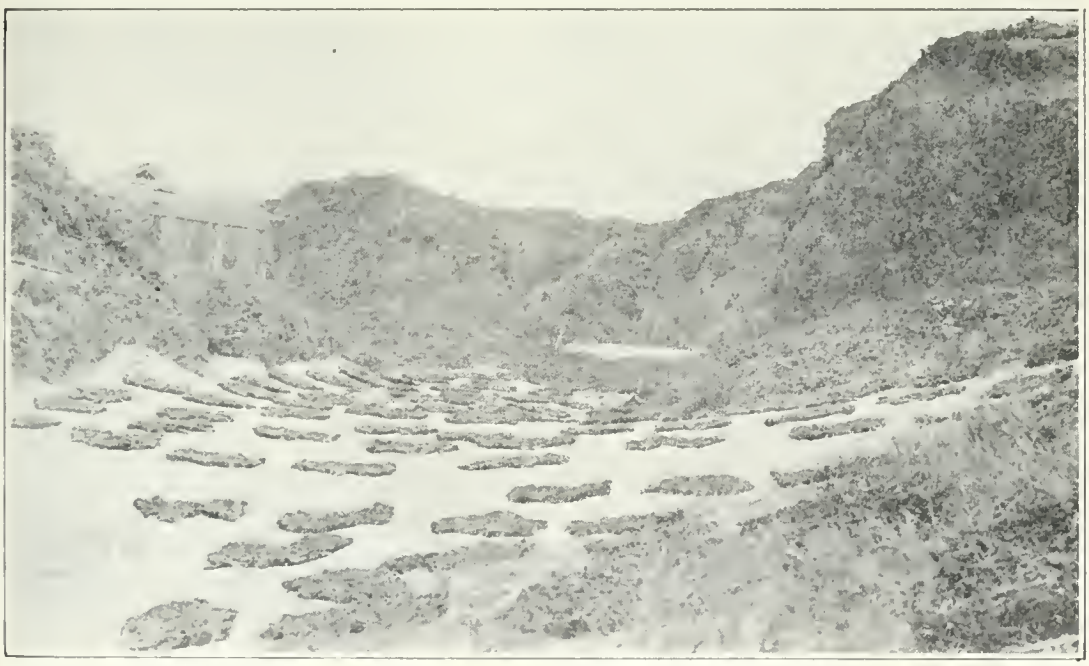


Fig. 26. Porphyra drying on the beach. Camp of Yuen Bon, Pescadero. Photo by Paul Bonnot, May, 1929.

There are two methods of gathering Porphyra. In the northern part of the state individuals gather the seaweed, dry it and sell to Chinese buyers located at definite points along the coast. The pickers are white men and Indians who live in the vicinity. In the southern part of California the Chinese are the only pickers. The business is an old established industry on this part of the coast. At intervals along the coast, close to some prominent reef or rocky section of the shore the Chinamen long ago built shacks as living quarters and store houses. One, two or three men constitute a camp. The camps are individual enterprises owned by one of the men or by the several who use it. From September until April the cabins are locked and empty. During November and December the camp owners may appear for a few days. They burn over the rocks on which they expect their crop of seaweed, using either kindling made of drift wood or big gasoline

blow torches. The fire clears the rocks of undesirable seaweeds and slugs and leaves a clean surface for the spores of the Porphyra to settle on and begin their growth. About the first of April supplies are hauled in, wood is cut for cooking and the seaweed crews start gathering their harvest. They work the low tides even at night. The seaweed is pulled from the rocks by hand and put into baskets. Two of these baskets on a shoulder pole are taken from the shore to higher ground to be dried. The wet seaweed is dropped loosely into rectangular "mats" about eighteen inches long, twelve inches wide and three inches thick. In a couple of days these mats have shrunk to about an inch in thickness. The natural mucilaginous content causes the individual fronds to adhere to each other. The mats are then stacked under cover ready for market. The seaweed is not dehydrated beyond the point of being rubbery. The dried material represents one fifth the weight of the wet. When enough dried material has been gathered for shipment, it is packed in large cylindrical burlap bags. The bags weighing about two hundred pounds each are shipped to San Francisco or to China via San Francisco. A small amount is used by local Chinese.

The average price in San Francisco in 1929 was 12 cents a pound. In 1930 due to the decrease in value of silver in China and the consequent decline of the buying power the price has dropped to 7 cents and there are few orders at even that price. A good many tons of the 1929 crop are still in storage awaiting orders. In 1929 300,000 pounds of Porphyra (dry weight) were harvested.

DISTRIBUTION OF SEAWEED CAMPS

Fort Bragg	G. Y. Hing, buyer
Gualala	Kong Yick, buyer
Point Arena	Yong Chong, buyer
Pescadero	Yuen Bon, harvester
Pigeon Point	Low Hing Tong, harvester
Ano Nuevo	Sun Lung, harvester
Monterey	Ye Chong, buyer
Monterey	Yee Hing, buyer
Monterey	Wing Chong, buyer
Cayucos	Chow Che Lee, harvester
Cayucos	Kin Hop, harvester
Cayucos	Yin Yee, harvester
Cambria	Henry Loo, harvester
Cambria	John Sing, harvester
Piedras Blancas	Hoo Lung, harvester
Piedras Blancas	Lung Hop, harvester
Santa Barbara	Bob Ord, harvester

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NETTING OPERATIONS ON AN IRRIGATION CANAL

By J. B. Phillips

INTRODUCTION

The Division of Fish and Game of California conducted a series of seining tests on the Sacramento River below the pumps of the Glenn Colusa Irrigation District,[1] during the spring and summer of 1929. These seining tests were for the purpose of ascertaining if food and game fish were going through the pumps into the irrigating canal. The results of these operations have formed a basis for a superior court hearing held at Willows, California, May 19-22, 1930, before Judge H. S. Gans of Tehama County. Inasmuch as the results of the operations were considered satisfactory, the gear and methods of operating are herewith summarized for whatever value they may have in future work along this line.



Fig. 27. View showing intake from Sacramento River to Glenn Colusa Irrigation canal. Photo by J. B. Phillips, June, 1929.

Under the direction of John Spencer, director of the Bureau of Hydraulics, J. B. Phillips of the Bureau of Commercial Fisheries and Roy W. Anderson of the Bureau of Patrol, were detailed to carry on the investigation. Supervising Captain H. B. Nidever and Captain S. J. Carpenter commenced the work. N. B. Scofield in charge of the Bureau of Commercial Fisheries acted in an advisory capacity throughout the operations, the success of which was in a large measure due to his helpful suggestions. Earl Tweede, superintendent for the district, kept in close touch with the operations. His helpfulness and cooperation were much appreciated.

Headquarters were established just below the head gates, permission being granted by the district. Seining operations were carried on almost continuously from April 18 to August 20, 1929.

[1] The District has nearly 123,000 acres under its network of canals. This acreage is cultivated in rice, alfalfa, pastures, orchards, and general crops. The assessed value is at $40 an acre.

DESCRIPTION OF SCENE OF OPERATIONS

Netting operations were carried on in the pool and canal just below the head gates.

The head gates of the Glenn Colusa Irrigation District are located on the Sacramento River, approximately 12 miles east of Orland and 4 miles northwest of Hamilton City. About three-quarters of a mile above the head gates, an island divides the river into two channels, the head gates being located on the west channel. The intake above the head gates is an open channel about the same width as the river, or about 200 feet wide, and makes about a 25-degree angle to the river channel.

Approximately 150 feet below the mouth of the intake is located the battery of 10 pumps called the head gates.[2] These pumps which are of three types, centrifugal, wood-screw and turbine, vary from 40 to 100 inches in diameter. The maximum capacity during the 1929

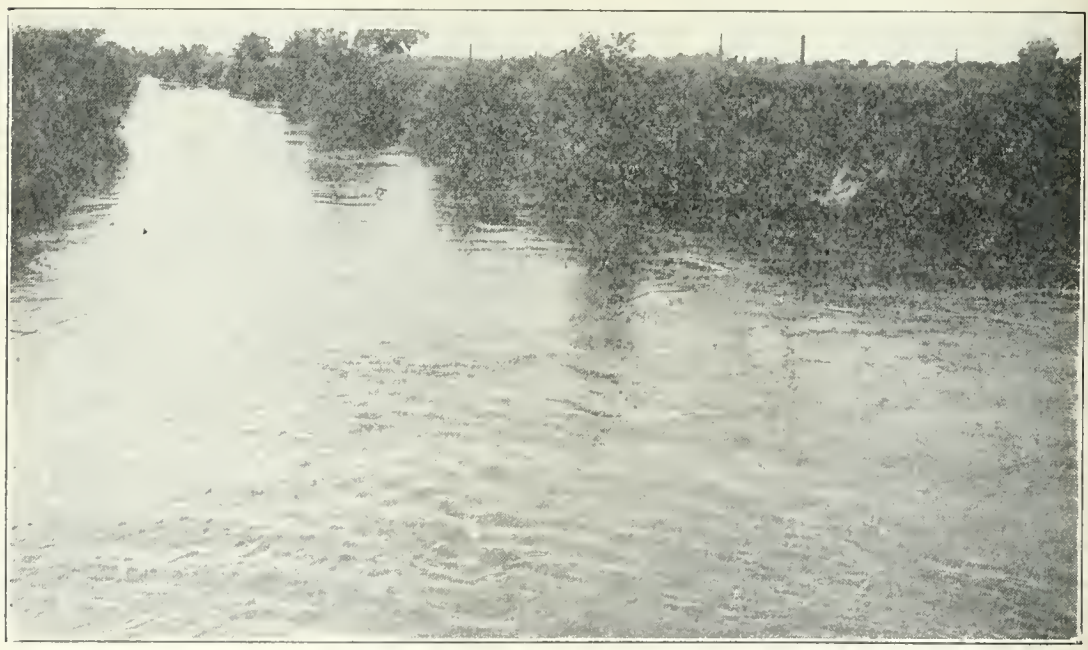


FIG. 28. View from Glenn Colusa Head Gates showing portion of pool and the canal below the pumps where the netting was performed. Photo by Roy W. Anderson, June, 1929.

pumping season [3] was 1700 second feet or close to 763,000 gallons per minute. From information obtained, it appears that during the seining operations, the amount of water going through the pumps varied from a minimum of 1150 second feet (516,000 gallons per minute) to a maximum of 15,000 second feet (673,000 gallons per minute). This amount of water coming through the pumps forms a pool just below the pumps, about 200 feet across and in places more than 26 feet deep. The water in this pool boils and eddies in various directions due to the different capacities of the pumps and the position of the pump outlets. The pool narrows down to the main canal in which the current is fairly uniform and steady. The canal portion where the seining was performed is on an average of 85 feet across and

[2]Pumps are necessary because the water must be raised from 6 to 8 feet in height from the river to the canal during the normal flow of the river.

[3]The pumping season usually starts about April first and extends into November or December.

12 feet deep, with a slope of about 1 to 1 on the sides. Practically the entire netting was done in the pool just below the head gates and the upper 500 feet of the canal.

DESCRIPTION OF NETS

The nets used in the seining operations were all of the same type, *viz* "river bag nets." These nets consist of a coarse mesh wing on either side of a long, cylindrical, finer meshed bag; the whole hung between parallel cork and lead lines. Out-of-water dimensions of the net are: wings, each 6 feet deep (vertically) and 17 feet long to center of bag mouth; the bag is 6 feet in dimeter and 20 feet long; the end of the bag is closed with a draw string; the mesh of the wings is $2\frac{1}{4}$ inches,

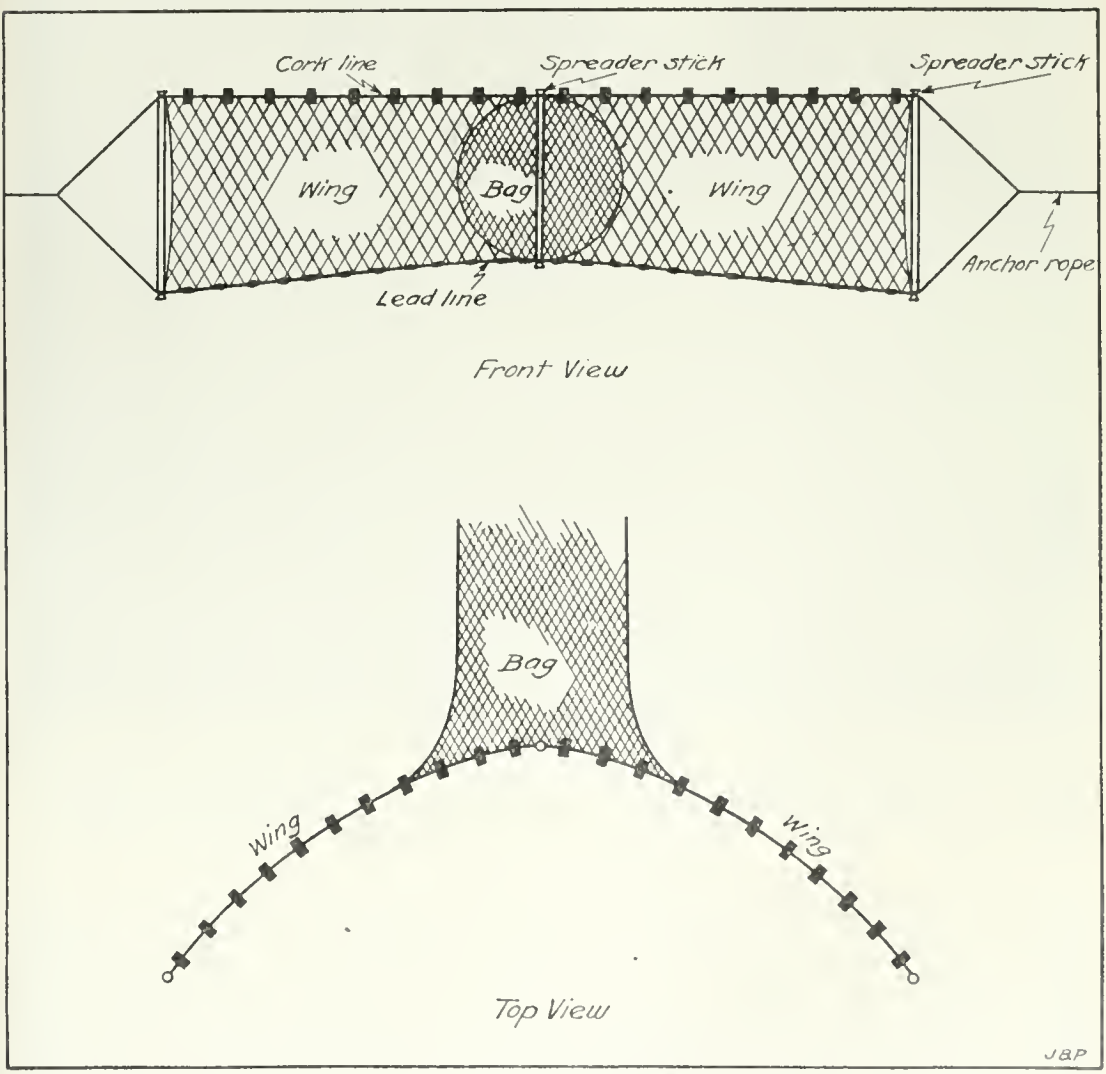


FIG. 29. A two-view drawing of a "River Bag Net," showing the position that it takes in the water. This was the only type of net used in the operations.

stretched (1-$\frac{1}{8}$ inches, open); the mesh of the first half portion of the bag is $1\frac{1}{4}$ inches, stretched ($\frac{5}{8}$ inch, open), and the mesh of the end half portion of the bag is $\frac{3}{4}$ inch stretched mesh ($\frac{3}{8}$ inch, open mesh).

It was found that better results were had in keeping the live fish in by inserting a "tunnel" in the bag a few feet from the end. To do this about 2 feet were cut off the end of the bag and this piece shaped in the form of a funnel, the same diameter as the bag at one end and tapering to 6 or 8 inches in diameter at the other end. The large end

was attached to the bag while the smaller end was suspended in the center of the bag by means of radiating pieces of twine of equal length.

METHOD OF OPERATING NETS

When in the water, the end of each wing is attached to a rope that is anchored on shore. The current of the water throws the net into a semi-circle, which in our case measured between 22 and 22½ feet across the front and varied in depth from 6 feet at the ends to 5 feet at the center (mouth of bag). This depth was kept uniform by a small pole at either end and at the center.



FIG. 30. A "River Bag Net" fishing. For this picture the cork line has been brought out of the water by the rope stretched across the canal. The bag trails behind, just under the surface of the water. Photo by J. B. Phillips, May, 1929.

Due to the strength of the current, the ropes were made fast on shore first and the net then fastened to the ends of the ropes in the water. In detail, this was done as follows: The desired position of the net in the water was chosen with due respect to suitable means of anchorage on shore. One end of a rope was then anchored on one bank of the canal, the balance of the rope taken into the skiff and the skiff was propelled until approximately the desired position of the net in the water was reached. The end of the rope that was to anchor the other wing of the net to the opposite bank was then tied to the free end of the anchored rope, and the journey continued across to the other bank where the second rope was anchored. Piling the net in the stern of our skiff, the wings of the net were made fast to the two free ends of the ropes and the net placed in the water. The anchor ropes were then freed, allowing the net to swing open. We found that best working results were obtained by having the anchor ropes at about a 45-degree angle to the mouth of the net.

When the nets were placed in the pool just below the pumps, they were tried experimentally at various depths. The depth was regulated by attaching weights to the bottom of the brail sticks at either end of the wings.

The nets were raised from the water and examined twice a day, in the early morning and in the evening. The nets were raised in the following manner: The mouth of the net was closed by bringing the two wings of the net together with the aid of a half-inch rope having a snap hook fastened to one end, and passing through a small metal snap block. The skiff was rowed to one end of the net and the block snapped on where the brail ropes are tied to the anchor ropes. The rope was then evened through the block, so that when the snap hook was fastened to the other side the two wings could readily be brought together by pulling on the free end. With the wings together, it was an easy matter to pull the net into the boat without detaching the net from its anchor ropes. The contents of the net were then emptied into the boat by loosening the draw string at the end of the bag. While the net was being pulled into the boat, it was shaken as free as

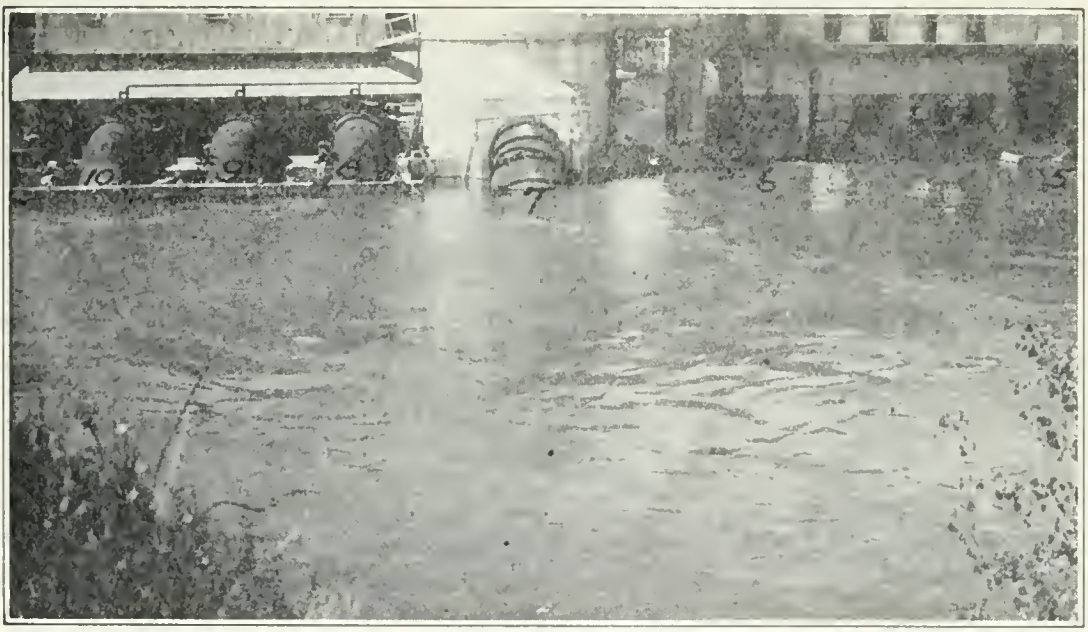


FIG. 31. View looking upstream showing portion of pool and some of the pump outlets that make up the "Head Gates." A net is almost submerged in the pool below outlet 7. (No. 5 to 10 are pump outlets. Outlets 1 to 4 are to right of picture.) Photo by J. B. Phillips, May, 1929.

possible of any debris and examined for tears. If the tears were minor they were mended in the boat; if serious, the net was detached from the anchor ropes (keeping the two ends of the anchor ropes fastened together for convenience in replacing the net), and taken to shore for a more detailed and proper repairing. After the bag was emptied, the net was either taken to shore as explained or set in a fishing position again by casting the net into the water bag first, then freeing the anchor ropes. During low water, dredging was done above the pumps by the Irrigation District in order to have a greater head for the pumps. On these occasions large amounts of debris went through the pumps. During these periods, if the nets were not taken out of the water they were kept closed by keeping the anchor ropes tied together after the nets were raised in the morning. Then in the evening when dredging operations had ceased, the nets were again set free in a fishing position.

About once every two weeks, a net was taken out of the water and given a "blue-stoning" (blue vitriol : $CuSO_4 . 5H_2O$), in order to remove algae growth that had accumulated on the webbing and ropes. A net was taken out in the morning, allowed to dry during the day, and soaked in the solution over night. The net was placed in a barrel, water poured in to cover the net, and the blue-stone placed in a cloth sack on top. The heavier specific gravity of the solution will cause it to shrink readily as it is formed. The proportion of this mixture was 8 pounds of blue-stone to 100 gallons of cold water.

RECORDING AND PRESERVATION OF EVIDENCE

The specimens or pieces of specimens were tabulated as to the net in which they were found, condition when found in net, species, sex, and length to nearest one-eighth inch. The smaller fish, such as the salmon and shad fingerlings, were wrapped in cheesecloth, while the larger fish and larger pieces were strung together. Tags bearing lot numbers were attached to facilitate examination at any time.[4] Food

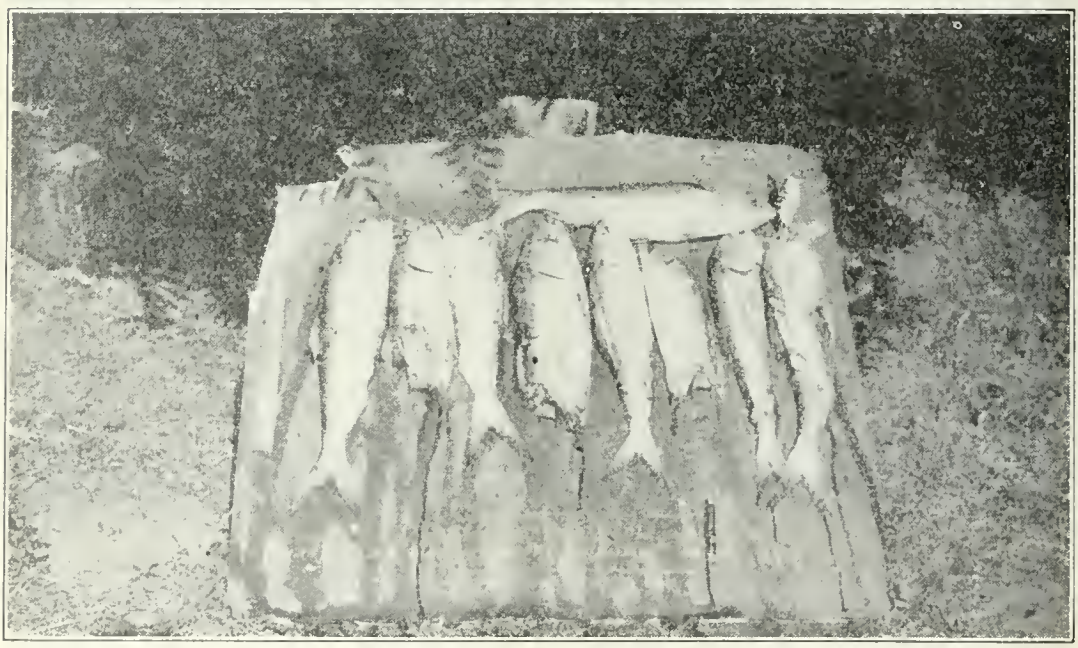


FIG. 32. Part of one morning's catch, consisting of nine adult shad which were all damaged by pumps. Photo by Roy W. Anderson, August 18, 1929.

and game fishes were separated as much as possible. Weekly reports were sent to the head office. These reports included, besides the above data, the daily records of water temperatures (morning and evening), weather conditions, and heights of water (taken from gauges of District). In fact, the daily records and observations can not be too full, as work of this kind will in many cases serve a two-fold purpose: first to determine if valuable fish are being destroyed; second, anything of scientific interest, bearing on the migrations of fish and similar data.

The specimens obtained through the seining operations were preserved in formaldehyde solution.[5] In preserving fish the specimens

[4] Notations were made with lead pencil.

[5] The regular Commercial solution of formaldehyde is 40-per cent strength. A solution of ample strength for preserving fish is obtained by adding 9 parts of water to 1 part of the commercial formaldehyde.

above the fingerling size should be slit along the abdomen so as to allow the preserving medium to permeate the inner organs. Otherwise, the specimens may be perfectly preserved on the outside but decomposed within. The specimens were first put down in 20-gallon fish shipping cans, such as are used by the Bureau of Fish Culture. It was found after a period of time however that the formaldehyde would eat through any exposed parts of metal. The specimens were then transferred to 20 and 30-gallon barrels, which served the purpose very well.

When transporting the formaldehyde solution can be poured off or the specimens taken out of the solution and simply kept wrapped in moist sacks, excelsior or other like material. In fact after a period of two weeks or more in the solution, specimens can be kept for indefinite periods in this manner. If the evidence is to be presented in a courtroom, it should be soaked for a day or more in several changes of fresh water so as to remove as much of the free formaldehyde as possible.

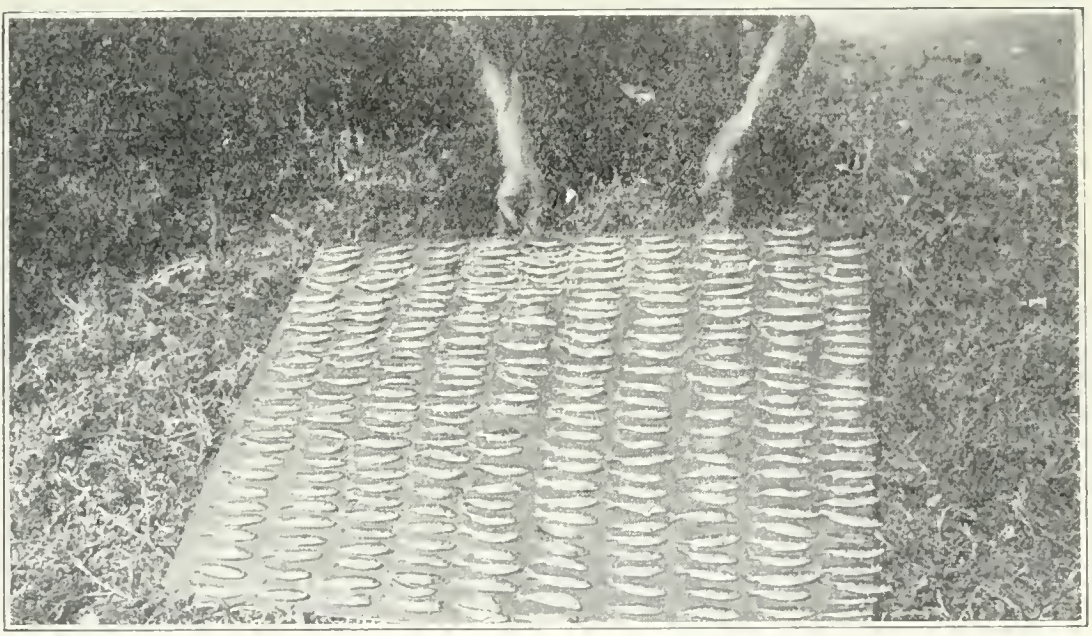


FIG. 33. Part of one morning's catch consisting of 290 salmon fingerling that were found in one net. Photo by J. B. Phillips, May 26, 1929.

BRIEF SUMMARY OF RESULTS OF OPERATIONS

Throughout the course of the netting operations, the usual number of nets fishing were two. During this time, which was about 4 months, we found close to 5600 fish or portions of separate fish in the nets. Eighty per cent of the total were food and game fish which included the following species: chinook or king salmon *(Oncorhynchus tschawytscha)*, steelhead and rainbow trout *(Salmo irideus)*, striped bass *(Roccus lineatus)*, large-mouth black bass *(Micropterus salmoides)*, blue-gill sunfish *(Helioperca incisor)*, Sacramento perch *(Archoplites interruptus)*, shad *(Alosa sapidissima)*, catfish *(Ameiurus nebulosus)*. Salmon and shad formed 70 per cent of the food and game fish total. Rough fish included the following: Sacramento sucker *(Catostomus occidentalis)*, carp *(Cyprinus carpio)*, split-tail *(Pogonichthys macrolepidotus)*, Sacramento pike *(Ptychocheilus grandis)*, hardhead or black fish *(Orthodon microlepidotus)*.

The number of fish netted was theoretically only a small percentage of those going through the pumps, as each net covered only a portion of the pool or canal. In the case of the fingerlings, which made up 86 per cent of the food and game fish total, the percentage netted was figured as 1 to 3 per cent. This percentage was obtained by comparing the cross-sectional area of the bag with the cross-sectional area of the pool or canal, where the net was located. This took for granted that the fingerlings would go through the large meshed wings. Also, schooling types of fish, such as the salmon and shad, could be expected to be found anywhere in a vertical cross-section below the pumps due to the egg-beater-like effect of the pumps. The term "fingerling" was used to designate all the young fish up to 5 inches in length, the fish over 5 inches being terms "adults." The bulk of the fish was caught in the nets during the night as evidenced by early morning findings.

Since only a small percentage of the numbers of fish going through the pumps were actually netted, the work shows that this irrigation district is continually destroying great numbers of valuable food and game fish.

THE RELATIVE EFFICIENCY OF THE SEMIPURSE SEINE COMPARED WITH THE ROUND HAUL NET

By H. C. Godsil

Within the past two years some important changes have been effected in the nets used in the sardine fishery. Members of the State Fisheries Laboratory have investigated these changes, and two publications on the subject have been written, one of which is still in press. ("Success of the Purse Seine Boat in the Sardine Fishery at Monterey, California," by J. B. Phillips, Fish Bulletin No. 23, just recently published, and "The Ring Net, or Purse Lampara in the Fisheries of California," by D. H. Fry, Jr., which is now being printed.) The writer is not primarily concerned with this problem. He has nevertheless had the opportunity to note the affect of changes in gear upon the catch of a particular boat fishing sardines at San Diego. The results are rather striking. Since they may be of interest to the industry in general they are recorded herein.

In the sardine seasons of 1928 and 1928, all the local boats fishing for San Diego canneries used the round haul (lampara) net. At the opening of the 1930 season, one boat had converted its lampara into a half ring or semipurse seine. This was done at a relatively small expense by lengthening the net a trifle, increasing the depth of the wings and adding a purse rope to the lead line so that the net could be closed rapidly. At somewhat greater expense a power winch was installed on the boat to facilitate the pursing of the net. The remaining boats in the fleet continued to use the round haul net.

The writer watched with considerable interest the success of this boat, and later decided to make a comparisan with one or more boats using the lampara in both years. The one boat finally chosen *(A)* was of the same size, and in regard to its net and the number of men in the crew was in 1928 strictly comparable with the one *(B)* under consideration.

In order to secure representative figures, only those days were selected when both boats landed sardines. This occurred 16 times. The total landings for these 16 days were:

Boat *A*	Boat *B*
397,345 pounds	379,065 pounds

The slight difference is in favor of boat *A*. On eight of these 16 days, boat *A* had the greater tonnage; while on the remaining 8 days, boat *B* was more successful. It is apparent that in the season of 1928 when boats and nets were comparable, results were strikingly similar.

Let us now examine the figures for 1930. Boat *A* remains as in 1928, with gear unchanged. Boat *B* has meanwhile converted its round haul net into a half ring or semi-purse seine and installed a power winch. Other factors remain the same.

The total lands for the season 1930 were:

Boat *A*	Boat *B*
354,270 pounds	657,390 pounds

Boat *A* secured this amount in 19 successful trips, while *B* landed nearly twice that quantity in 21 trips. As in 1928, we shall select only those days when both boats landed sardines. There were 14 such occasions, and the total landings for these days were as follows:

Boat *A*	Boat *B*
267,750 pounds	529,440 pounds

In these 14 days, *B* landed just twice the quantity of fish, or a daily average of 37,817 pounds against 19,125 pounds for *A*. The averages for the 16 selected nights in 1928 were similar for the two boats (24,834 pounds for *A*, and 23,691 pounds for *B*). In the same year each boat was more successful than its competitor eight times in the 16 days. In the 1930 season boat *B* surpassed *A*, in the quantity landed, 12 times out of 14. On the assumption that the net was the controlling factor and that no other influences were consistently operating to favor *B*, we may conclude that in this instance the round haul net was only about 50 per cent as efficient as the half ring or semi-purse seine.

GAME BIRDS AND CITRUS FUMIGATION

By Gordon H. True, Jr.

For a number of years the Division of Fish and Game has been receiving, at intervals, reports of heavy mortality among game birds, particularly quail, as a result of the commercial fumigation of citrus groves. It is a practice among citrus growers to fumigate their groves with cyanide gas for the purpose of controlling scale and other insect pests. This is accomplished by placing canvas "tents" over the trees to hold the gas which is then introduced. The "tents" are left on for a specified length of time and are then "pulled" to the next row of trees. Since the fumigating is done at night roosting birds may be imprisoned beneath the canvases and destroyed by the poisonous cyanide fumes. Hence the reports from various individuals and sportsmen's organizations of "hundreds of birds" being destroyed where this method is in vogue.

Since it was obvious that a detailed study of the situation was necessary, a survey of a number of groves was made by Deputy E. C. Vail who chose for his work the citrus-producing area to the east of Dinuba and Visalia in Tulare County. Deputy Vail commenced his investigation on July 10, 1930, and continued the study for period of 20 days during which time 14,916 trees, comprising 18 distinct groves, were fumigated. Of this number 4925, or approximately one-third of the trees, were inspected. The inspections were made at dawn following each night of fumigation. A record was made of the number and species, the latter in so far as it was possible, of birds and other animals that were destroyed and notes were taken relative to the situation of the grove with respect to the surrounding country and to the activities of the fumigating crews.



FIG. 34. The result of commercial fumigation of seven acres of oranges on the A. L. Arnold Ranch: Twelve quail, three roadrunners, four doves and one goldfinch. Photo by Gordon True, Jr., July 15, 1930.

Quail were found dead in eight of the groves, the total kill amounting to 27 birds. Twelve birds were found in one grove, two others yielded four and six respectively and one was recorded from each of the remaining five. The largest number were found in an orchard which was bounded on three sides by wild, rocky land. Deputy Vail had visited the grove on the previous evening and had watched five coveys of quail, numbering in all about 75 birds, coming to roost. Dead doves were recovered from six groves, the maximum kill in any one orchard being a half-dozen birds. The total number was twenty, a large proportion of which were young birds which were not yet able to leave the nest.

The list of birds also included a number of non-game species; namely, 17 sparrows, ten mocking birds, three goldfinches, three roadrunners and one linnet, a bluejay and a "brown bird somewhat smaller than a robin" which was probably a towhee. To the list of birds must be added the record of the deaths of four cottontails and on unfortunate tree-toad.

The above record of birds taken shows that one bird was killed for every 100 trees fumigated, or approximately one bird to the acre. In considering game birds alone the ratio becomes one to 200, or one game bird to two acres. When the number of birds which probably spend the night in an orange grove is considered, the death rate is not very large. These results would seem to lead to the conclusion that the problem is not yet a really serious one especially when the importance of the fumigation work is considered.

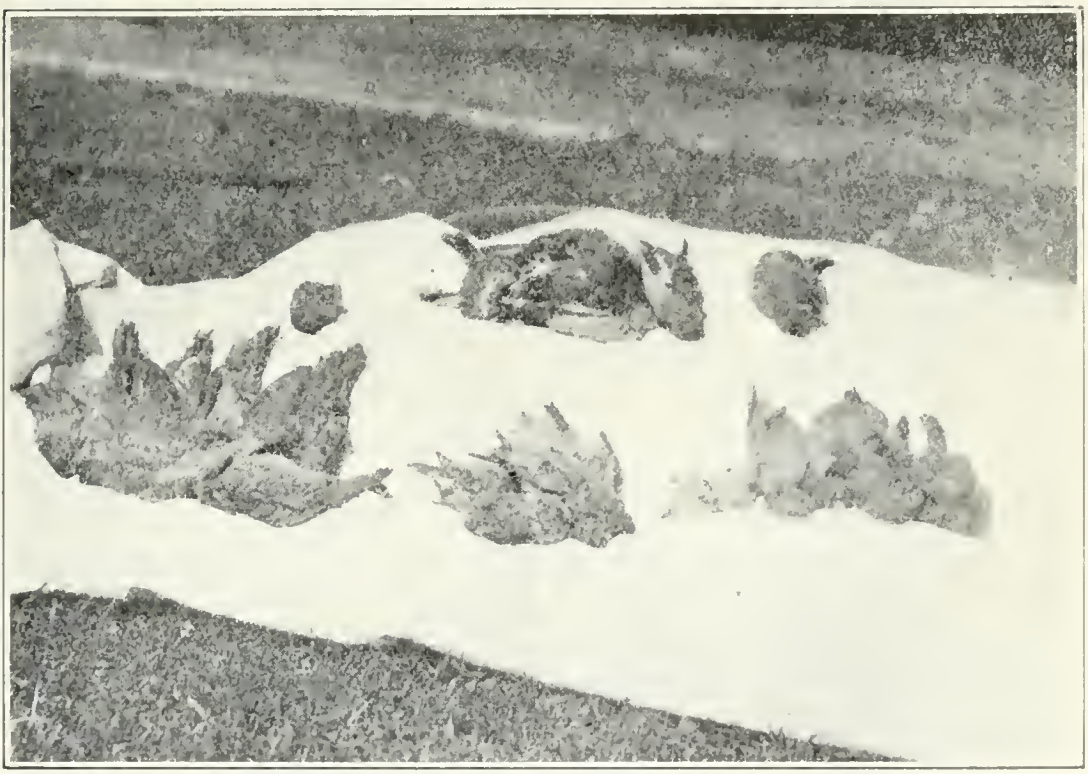


FIG. 35. Birds killed by fumigation: Six quail, seven doves, thirteen linnets, seven mockingbirds. Photo by E. C. Vail, July 29, 1930.

A perusal of the notes taken by the investigating deputy reveals the fact that nearly all of the birds killed were, at the most, half grown, some being destroyed in the nest. Most of the adults seemed able to leave the cover as the "tent" was being pulled over. Here, we have another interesting fact. In those trees which were of a relatively small size bird mortality was the greatest because, due to the size of the trees, the time required to "pull" the canvas was short. In the older groves, where the trees were larger, the extra time required in setting the correspondingly larger tents gave the birds an opportunity to make their escape. Still another point to be noted is the disposition of members of the crew. Some men, hearing a bird strike the inside of a tent, would lift a corner of the canvas and release it. Others did not care to take the trouble and in consequence, the birds were killed.

Serious or not, any condition resulting in a needless loss of wild life should be corrected if possible and there are certain steps which may be taken to reduce the number of birds killed as a result of cyanide fumigation. First, the orchard owner, who should be interested in maintaining the population of game birds on his property, should go ahead of the fumigating crew and drive out the birds; second, the loss may be considerably reduced if the members of the crews will make it a practice to release imprisoned birds when it is possible; and lastly, in those groves in which large numbers of birds are killed year after year spraying may take the place of fumigation as a method of controlling insect pests.

REPORT OF DAMAGE DONE TO PROTECTED GAME BY COMMERCIAL FUMIGATION IN TULARE COUNTY

By Deputy E. C. Vail

Date	Orchard owner	Location	Number of trees	Variety	Number inspected	Quail	Doves	Cotton-tails	Yellow warblers	Mocking-birds
July 10	H. Brauns, Woodlake	Half mile east of Woodlake	1,000	Oranges	500	1				
July 11	Mrs. Lankinshire, Woodlake	Two and one-half miles east of Woodlake	800	Grape fruit	315					
July 11	R. T. Lankinshire, Stone Correl	Foothills one-half mile; grain two sides	1,000	Grape fruit	300		4		1	[2]
July 12	J. D. LaGrande, Elderwood	Three-quarter mile to foothills	280	Oranges	280					
July 12	Kline Brothers, Twin Buttes	Orchard, all sides	700	Oranges	104					
July 13	M. Flodin, Ivanhoe	Grapes, three sides	1,600	Oranges	340					
July 13	Marks Brothers, Three Rivers	Pasture, three sides	186	Grape fruit	186			3		
July 14	Kline Brothers, Twin Buttes	Orchard, three sides	2,000	Oranges	200					
July 14	Jack Kortz, Woodlake	Orchards on all sides	1,000	Oranges	200					[1]
July 14	Mrs. Lankinshire, Woodlake	Orchards on all sides	500	Grape fruit	50	1				
July 15	L. T. Arnold, Twin Buttes	Pasture, three sides	700	Oranges	700	12	4	[3]	1	
July 16	D. L. Strine, Ivanhoe	Oranges, west and north; grain, east and south	700	Oranges	400					1
July 16	Kline Brothers, Twin Buttes	Oranges, north and east; pasture, south and west	800	Oranges	50			1		
July 18	H. W. Anthony, Stone Correl	Pasture and grain on all sides	600	Oranges	400	1	4		1	1 [4]1
July 19	Peter Flodin, Ivanhoe	Vineyard, east and north; pasture, west; oranges, south	1,600	Oranges	450	1	1	[5]1		
July 20	U. T. Strine, Ivanhoe	Oranges, north, south and west; vineyard, east	1,000	Oranges	200	1	1		[5]1	
July 21	P. Wing, Three Rivers	Grain and pasture, all sides	450	Oranges	250	4				
July 30	Harold Ranch, Arosa	Three miles north, 10 acres		Oranges		6	6	[6]1		7 [1]14

[1] English sparrow. [2] Road runner. [3] Brown bird. [4] Linnet. [5] Blue jay. [6] Tree toad.

NOTE.—Nearly all birds killed were half-grown or less. Found that the chance of catching birds is a lot less in large trees where they use forty-foot sheets, or better. The larger tent takes longer to put on and gives birds better chance of escape. Where fumigation was done in moonlight or light night, the birds flushed ahead of crew.

Found that the average kill would not run over one bird to every one thousand trees, and in questioning men that have followed fumigation for years, found that they all agreed that their experience had been approximately one bird to every one thousand trees.

The disposition of canvas crew had some bearing on amount killed. Some men were inclined to raise the tent and free the birds when they heard them hit side of tent; others were not interested enough to give the little extra effort.

The largest kill checked was at the Arnold Orchard which butted up against the rocks in foothill country, and I counted five covey of quail going to roost at 7.30 p.m., in trees. Perhaps seventy-five birds in all and out of that number found twelve dead.

CALIFORNIA FISH AND GAME

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There is often a difference between what laws the hunter and angler want and what laws are most effective in insuring a state-wide supply of game and fish for the hunter and angler.

RESEARCH ACCOMPLISHMENTS SUMMARIZED

John L. Farley, executive officer, reviewed the research work of the Division of Fish and Game in an address on August 28, 1930, before the Section on Scientific Research of the Commonwealth Club of California. His remarks constitute a clear and terse statement of major accomplishments. Readers of CALIFORNIA FISH AND GAME are familiar with many of the details presented, but it is doubtful if they have a comprehensive picture of the entire field of endeavor. In this sense the address is an invaluable contribution and is presented in full.

The Bureau of Commercial Fisheries claims the credit of having compiled the first complete and accurate record of the catch of fish of commercial importance in California based on fishing effort and equipment units. The system developed in finding facts and acquiring the statistical record has served as a model for the entire world and has been adopted by the federal government and by other states. In this respect California not only is in the front rank, but heads the procession.

The bureau, in its organization, places research on an equal plane with the administration and enforcement of laws and regulations. Its laboratory at the Terminal Island is a fact-finding institution, systematically collecting and cataloguing information in order to obtain a clearer picture of what is happening to the resources safeguarded. Research is not considered a side issue. It is directly depended upon for success.

A knowledge of the amount of fish that may be caught each year without impairing the future of a particular fishery is considered fundamental to the management of the fishery. Basically, this involves an understanding of the extent of the supply and the amount of fishing effort put forth to acquire a given return. For instance, if with increased fishing effort—larger and faster boats, more efficient gear and greater expenditure of energy—the catch of a particular species actually becomes less and less, it is reasonably certain that the species is on the decline.

Two systems—catch records and sampling the catch at regular intervals, enable detection of the earliest signs of depletion. The first method is largely statistical. Records accurately compiled through the years show that daily catch of each species of commercial importance for each boat in each fishing region of the state. The second, the sample method, enables studies of the age classes of fish and determines whether a sufficient number of older fish are surviving to insure a future supply.

By means of this system the bureau is able to continually "feel the pulse" of the commercial fisheries, to trace the effects of legislation and to recommend to the legislature corrective measures neceessary to maintain the fisheries in a healthy condition.

A consistent effort has been made to secure accurate and scientific data on the life histories of certain species. Of outstanding value are studies made of the habits, breeding capacity, rate of growth and times of run of the striped bass. Such notable success has attended the introduction of this fish that it is sufficiently numerous to support a fishery and afford sport to thousands of anglers as a game fish. So enthusiastic have some striped bass anglers become over the future possibilities of the sport afforded that they have demanded further restriction of the commercial fishermen. Because of the scientific data on hand, the division has been able to point out that possibly three-fifths of the spawn-bearing run of striped bass escape the fishermen's nets. This percentage assures a breeding stock sufficient to maintain the supply. During the open season another safeguard prevails. The law forbids the use of a net having a mesh of less than five and one-half inches. It is estimated that at least one-fourth of the run is protected by this regulation.

Fish Bulletin No. 24, "An Analysis of the Catch Statistics of the Striped Bass Fishery of California," by J. A. Craig (1930) gives statistics showing an increase in the abundance of striped bass while undergoing the strain of fishing.

Another *Fish Bulletin No. 17*, "Sacramento-San Joaquin Salmon Fishery of California," by G. H. Clark (1929) analyzes catch records and summarizes the other factors which have conspired to bring about depletion.

As early as 1897 attempts were begun to solve the problems connected with the life history of salmon. Under the direction of Dr. J. O. Snyder, of Stanford University, marking experiments were carried on. Salmon were tagged and operations conducted until the sea range of the fish was known. Sacramento River fishes were found as far north as the Klamath River, but did not go into Alaskan waters. Klamath River fish were caught as far south as Monterey Bay. The investigations also disclosed the rate growth of salmon of known age.

Dr. Snyder is now conducting an inquiry to arrive at some conclusion as to the contribution of natural propagation to the salmon supply. The Shasta River, a tributary stream, has been selected. Salmon formerly spawned in great numbers in this stream and the run is still relatively numerous. It possesses the usual barriers and obstacles, such as dams, irrigation ditches and the like. A rack thrown across the stream is so constructed as to make possible an accurate enumeration of the fish as they ascend to the spawning beds. A system has been devised to accurately approximate the number of fingerlings which the spawning beds yield. The movements of the ensuing young will then be followed until they reach the mouth of the main river and their welfare studied in relation to obstacles encountered which civilization has imposed. During the enquiry no artificial stocking of the Shasta River is to be made.

Stream surveys for guidance in planting young fish are underway. Blind planting or planting by rule of thumb methods is wasteful. Wisconsin has developed a wonderful system. A set of cards record the carrying capacity and the productivity of certain streams. Details as to the food producing capacity of the streamside, of light penetration and the different planes in depth where different species thrive best have been worked out scientifically. California is compiling a set of cards and it is hoped that the data they will contain will permit more intelligent and efficient planting.

The health of the people of the state due to sickness from eating sardines has been safeguarded by investigations of the Hooper Foundation for Medical Research. In 1924 a canneries inspection service was organized and with this came the realization of the need for research to eliminate so-called ptomaine poisoning. At the request of the canners a sum of $15,000 has been allotted each year since 1926 to the Hooper Foundation. Under the able direction of Dr. K. F. Meyer the organism causing the poisoning was determined and ways and means of preventing its presence in canned goods determined. Now, by cooking under proper pressure and temperature for a sufficient length of time and by using other sanitary precautions, the organism has been almost entirely eliminated to the great benefit of the canning industry and the general health of the people.

The Hooper Foundation has attempted to discover the source of mussel poisoning. During summer months the use of mussels is always somewhat dangerous because it is impossible to distinguish the sound from the diseased. The poison is believed to be the result of certain diatoms used as food by the shellfish and may be influenced by spawning conditions. Deputies of the division have aided greatly in this cause by securing specimens up and down the coast for examination.

The duck disease causes the loss of millions of waterfowl yearly. Paul Shaw, a toxicologist working under Dr. Meyer, has determined the probability of "alkali poisoning." By forced feeding in the laboratory of certain mixtures of salts known to exist naturally in the diseased areas, a "sickness" has been produced. This knowledge is of immense value. Its importance in the selection of game refuge sites is obvious.

Studies to identify external and internal parasites of deer, quail, ducks, geese and other game species and to determine the life-cycles and pathogenicity of these parasites have already produced many "finds," the results of which have been published in the Division's quarterly, California Fish and Game.

Of outstanding interest is the discovery of a malaria blood parasite in California valley quail by E. C. O'Roke, which is transmitted by a biting bird-fly belonging to the same family as the sheep tick. This parasite has undoubtedly been a factor in reducing the quail population.

To preclude every possibility of pheasants raised on state game farms being liberated and serving as reservoirs of disease for the infection of poultry, the game farms have been rigidly inspected and the unfit eliminated. Electric hatching and brooding devices have done away with the use of domestic hens and removed all possibility of young pheasants contracting disease from domestic mothers.

Agriculture has furnished an attractive food supply for game. Rice growers complain of depredations of mudhens and of

blackbirds. In some regions deer have become so numerous that they constitute a threat to growing crops. Field investigators have attempted to winnow the real damage from the fictitious and exaggerated. Efforts to perfect control measures and find effective repellants are in progress.

Inquiry is being made into the food habits and eeconomic relations of birds and mammals considered destructive to game. Fur-bearers represent a valuable natural resource. It is hoped that the facts gathered will show whether campaigns desired by sportsmen to exterminate certain predators are wise or whether the better course to pursue is that of allowing control measures which provide an annual crop for the trapper.

Considerable work has been done on the status and economic value of birds by Dr. H. C. Bryant. The western meadowlark has been studied with reference to accusations of grain growers that the bird was destructive to crops and for this reason not deserving of protection. Stomachs of more than 2000 birds proved its value as a weed destroyer and as a controller of insect pests. Stomach analysis of roadrunners showed the bird to be an efficient destroyer of rodents and insects. A bulletin is now being printed on the "Quail of California" by Donald D. McLean. This is the harvest of intensive field investigations extending over the whole life-cycle of the species studied, and presents many new facts contributing to a better understanding of the valuable upland game birds.

The wide field covered by the research work of the Division and the numerous projects brought to completion should merit the growing confidence of the people of the state that conservation problems are being scientifically solved in adequate measure. Research has been on a high plane; directed by men of state-wide and national reputation. Valuable facts have been gathered, useful in planning protection and legislation.

SLAUGHTER OF GAME BIRDS IN EUROPE LAMENTED

A statement recently coming from the office of the National Association of Audubon Societies says the commercialization of wild game birds continues without abatement in Europe, according to the American Game Protective association.

Dr. T. Gilbert Pearson, who has just returned from presiding at the fourth conference of the International Committee of Bird Preservation, which was held in Amsterdam, Holland, stated:

"I again stressed the importance of stopping the sale of game birds not actually reared on estates or game farms, as such commercialization tends to overkilling with a resultant depletion of the total supply.

However, my appeal failed to strike a single responsive chord. Among the official representatives from our national sections in 16 countries, including many of Europe's leading exponents of wildlife protection, I did not succeed in getting one supporting voice. On other occasions in the past, my pleadings have likewise fallen on deaf ears. From these and other experiences, it is quite evident that Europe is a long way from accepting the idea of the noncommercialization of wild game which is one of the first principles of wild-life conservation in the United States and Canada.

Golden plovers are netted in great numbers in some of the western European countries. I was told that 30,000 were taken in a single season in one section of Holland. Migratory quail are also netted as they cross the Mediterranean, northward in spring and southward in autumn. On May 2, 1930, the ship Umbria, arrived in Genoa, Italy, from Egypt, with 30,000 live quail aboard, and I was informed that all ships coming from Egypt at this season of the year bring enormous consignments of these live birds which are used for food, and to a considerable extent are shot from traps.

Ducks are caught in great numbers in the carefully planned 'decoys.' Between 100 and 200 such decoy ponds appear to be in operation in Holland; others in Germany, France and in some other countries.

Many species of song birds still continue to be taken in nets, the necks wrung and the bodies sold for food.

However, some progress is being made. Prussia recently had adopted a very forward looking law for wild-life protection. Among other things, it prohibits the use of pole-traps for catching predatory birds. Belgium has restricted the number of species of small birds that can be caught in nets, snares, or shot for food; and, lastly, the Fascist government of Italy has forbidden the blinding of song birds by red-hot needles, to be used as decoys; a practice which has been in vogue since the days of ancient Rome."

IN MEMORIAM

I. L. KOPPEL

Deputy I. L. Koppel died Wednesday, November 5, at his home in San Jose. For two years he had known that his time was short, but during that time he never lost interest in his work.

He was first appointed a regular deputy August 1, 1909. Like many other good officers he had a profession—law, but he found more pleasure in conservation work than in law practice. The respect in which he was held by his fellow citizens of San Jose was evidenced by the mass of floral tributes and the huge attendance at the funeral Friday.

We extend our most sincere sympathies to his wife and son, Irving.

STUDY FISH PROBLEMS

The following is an excerpt from an editorial, entitled "Facts or Fiction," which appeared in the Yreka *News* during the latter part of October:

"The research work that the State Department of Natural Resources, Division of Fish and Game, is doing in Siskiyou County is one of the most hopeful signs that has come to light that something intelligent may be done to stay the rapid decline of salmon in California streams and notably in Klamath River.

It is a foregone conclusion that the Klamath will be the last stand of this finest fish in the state. Pollution of water, salt water barriers and other obstructions are rapidly exterminating them in many of the streams, once their natural habitat.

It is sincerely to be hoped that the opposition that has developed to the work at the mouth of the Shasta River and in other places in the county will be dissipated with a better knowledge of the real significance of effort that is being put forth under the direction of J. O. Snyder.

That Mr. Snyder is a real friend of the fish and is an authority on the subject, can not be doubted by anyone who has listened to his intelligent discussion of the problems now facing the fishermen of the state.

The ordinary sportsmen is likely to jump at conclusions, based on the meager observation and hearsay and, in the main, the knowledge of the average fisherman regarding fish is very little and that very little is often erroneous. The proof of this lies in the fact that no two fishermen, as a rule, will agree upon an one set of statements.

The division is almost daily disproving one or more of the popular beliefs regarding the habits of the fish and discovering facts which the layman never dreamed of. It is not within reason that this data is not going to be valuable to the state in its effort to stop the depletion of the salmon supply."

HUNGARIAN PARTRIDGES ARRIVE IN CALIFORNIA

Twelve crates of Hungarian partridges have just arrived in California. The birds were purchased in Czechoslovakia several months ago, shipped to New York and thence across the continent by fast train. Only 12 birds were lost out of the shipment of 643.

The crates were taken from the cars at Suisun, Solano County, and transported to the state game farm at Yountville. It is the third shipment of these birds to be received in the past few years.

According to August Bade, superintendent at the farm, the partridges will be held in specially prepared pens until they have rested sufficiently from the long trip. When the birds are acclimated and conditioned they will be ready for liberation.

Hungarian or gray partridges have met with such fine success in many states and Alberta that a long open season is permitted and the birds are increasing even in the face of this practice. Their natural reproduction, as checked in many places, is just double that of quail and pheasants. In Washington it was found that they increased at the rate of 16 for each pair while the average for quail and pheasants was eight.

The natural habitat of the Hungarian partridge is the rolling hills and grain fields that was the former home of the prairie chicken. On the wing they are a match for the speed and cunning of the bob-white or California valley quail. Another fine feature of this bird is the fact that they do not congregate in numbers during the winter. The family, under the guidance of two parents, remains as a single unit until the mating season.

It is the life history and natural habits of the bird that led the Division to believe that they would do well in this state. When established, the Hungarian partridge will not only offer excellent sport for the hunter, but will improve the natural beauties of our out-of-doors and divert concentrated shooting of any species.

LION LANDS ON BACK

Cats do not always land on their feet! The old theory that no matter how the members of the cat family fall, or how far, they invariably land on all four feet has just been discredited by Jay Bruce, state lion hunter.

Bruce and his trained dogs recently treed a huge male mountain lion up in the Silver Creek country. The animal, it weighed 160 pounds, climbed to the 60-foot level and was attempting to climb to a higher position when it lost its footing.

The animal made several complete circles while falling and landed squarely on its back. The force of the fall caused the cat to lose consciousness for several seconds and the dogs "piled" on to finish the job.

But the lion soon came to and had different ideas about the problem. Clutching one of the dogs with its powerful front feet it sought to rip the animal open with the hind claws but Bruce interceded with a well-directed pistol shot and ended the lion's career.

In examining the cat the hunter discovered that one front foot contained but one toe and claw. A farmer in the district reported that a lion had left its toes in a trap, about ten miles distant from the spot, last January.

Bruce said that the animal measured seven and one-half feet from nose to tip of tail. It had killed many game and domestic animals before being taken.

JUDGE LUCAS DECIDES CASE

An important decision affecting the conservation of the commercial fisheries of California has just been rendered by Superior Judge H. C. Lucas of Santa Cruz County. The case was an action brought by the Fish and Game Commission against six Santa Barbara fishermen for operating drag nets in what is popularly known as San Luis Obispo Bay. The law prohibits the operation of drag nets in bays in district 18, an ocean district which runs from Monterey Bay to Ventura County, and was passed by the legislature for the purpose of preventing the wholesale destruction of baby halibut which take refuge in the shallow water of bays. The technicality raised by the fishermen who operate the boats for Larco Bros., well-known fish dealers of Santa Barbara, was that the Coast Pilot describes San Luis Obispo Bay as the small inner anchorage which extends from Point San Luis to the mouth of San Luis Obispo Creek, a distance of about three miles, and what has been popularly considered San Luis Obispo Bay, the large bight extending from Point Buchon

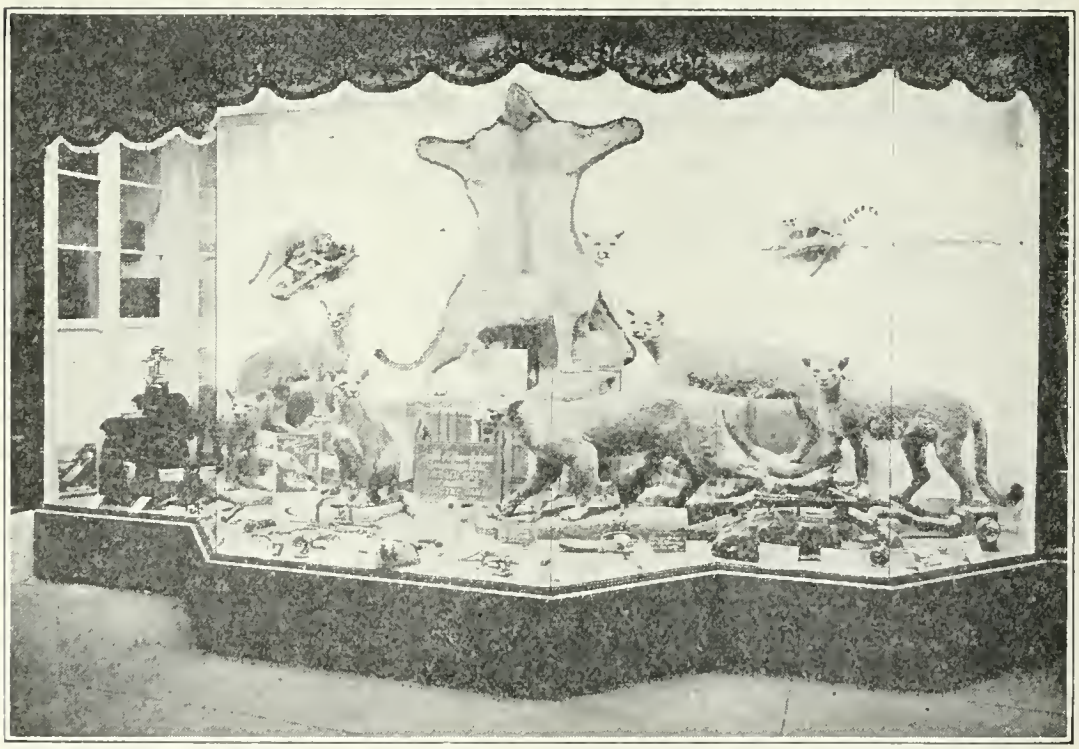


FIG. 36. Display of mountain lions caught in the mountains of Ventura and Santa Barbara counties with steel traps by Herman Keene. Photo courtesy of Shaffers, Ventura, California, April, 1929.

to Point Sal, is without a name and is therefore not a bay.

This decision will bar drag net boats from operating in this large bay lying off Pismo and Oceano beaches and will do much toward saving what is left of the halibut banks in that region.

A number of years ago the use of drag nets was prohibited in district 19, which extends from Santa Barbara County to the Mexican line, for the reason that when these nets were operated in shallow water for halibut they would destroy, for each ton of fish of marketable size they would catch, three times that weight of halibut too small to market. When this destruction is considered in numbers of small fish killed and thrown away, the waste and damage to the fishery can be appreciated.

The case for the Division of Fish and Game was handled by Assistant Attorney Ralph W. Scott, and much credit is due him for his energetic handling of the litigation.

OIL POLLUTION

There is a very interesting story in the October issue of *The Auk* on "The Menace of Oil Pollution." The author, Frederick C. Lincoln, gives much data on this strong menace to our bird and fish life and he tells what is being done and should be done to prevent the trouble.

In 1914 there were only 501 vessels using oil for propulsion with a total of 1,721,747 gross tons—by 1925 the total number increased to 3822 vessels of 19,372,615 tons, and these figures include only vessels of 500 gross tons or over.

The story tells of the practice of pumping salt water ballast from oil tankers beyond the three-mile limit and that a report in 1925 showed that approximately 5500 tons of heavy oil are discharged in nonterritorial waters near New York Bay, and that possibly 17 per cent of this may be carried ashore by the winds, tides and currents.

It has been found, the author says, that when birds alight on an oil-covered surface, their feathers soon become so saturated with the oil that they are unable again to take flight. The fine down that insulates their bodies against cold and water becomes matted and watersoaked, the skin is exposed to the elements and the birds die from cold and hunger, or are mercifully drowned. Live birds in this oil and water-soaked condition have been rescued, washed clean with soap or some other solvent or emulsifying agent, dried out, and liberated without suffering any apparent effects, but unless human aid is rendered birds that alight in an oil-covered area are almost certainly doomed to death.

Apparently the waters along the eastern coast suffer a great deal more from this menace than do ours on this coast. He tells that the waters of Chesapeake Bay, Palmico Sound, and points in the coastal waters of South Carolina, Georgia, Florida, Louisiana, Texas and the Pacific Coast from Puget Sound south to San Diego, have frequently been the scene of great destruction of waterfowl from oil.

"What is the answer?" the story says. "Many states have passed stringent anti-pollution laws which if vigorously enforced would do much to relieve the deplorable conditions existing in vast areas of coast, river, and marsh." Some states, notably California, have shown a most commendable activity in enforcing these laws, but in others they exist merely on the statute books.

In conclusion the story says that "the laws enacted should help to reduce the danger from oil pollution, but constant vigilance must be exercised so that still further improvements will be made and that there will be no recurrence of the heavily polluted waters that have already taken such heavy toll from the migratory waterfowl of America."—Earl Soto, San Francisco, October, 1930.

ALTITUDE OF BIRD FLIGHTS

A very interesting article appeared in *The Condor*, November, 1930, entitled, "Aeronautics of Bird Flight," by Sterling Bunnell, from which the following is quoted:

"As seen from an airplane birds are creatures of the earth's surface and seldom stray far above it. They seem to be part of the evolutionary biochemical reaction between the surface of three media—land, water, and air. In fact, animal life and plant life are seldom found far from the juncture planes of these three media. Hawks and buzzards are sometimes seen at 1500 feet above the earth, and migrating birds have been seen at great altitudes, but they have been at such times crossing mountain ranges and so have not been far above land.

"Colonel R. Meinertzhagen, after interrogating 600 English aviators, concluded that most birds migrate at altitudes under 3000 feet with the majority well under this altitude, and that they usually fly below the clouds, so as to keep landmarks in sight. In only 36 instances were birds seen over 5000 feet and in only seven recorded cases were they seen between 8500 and 15,000 feet.

"Flying is laborious at high altitudes where the air is thin. The familiar Jenny airplane reached its maximum height at about 5000 feet and many modern planes can not exceed an altitude of 10,000 or 12,000 feet. Therefore, most of the birds

that soar, with such few exceptions as the condor of the Andes, which has the greatest wing area of any bird, are found at lower altitudes. An example of the poor flight of birds in high altitudes is seen in the method of quail hunting in the Andes at 15,000 feet, where a crowd of people and dogs run after the quail which average but three flights and then is so exhausted that it can be picked up."

VALUES OF WILD LIFE

"It is always difficult to foresee the needs of the generations to come, and nowhere more so than in the field—we may indeed say the wide realm—of enquiry; yet it is safe to anticipate the needs of handing on to our successors all we can of our and their heritage of the earth as little impaired as we can contrive it to be. We may be sure that they will more readily pardon the waste we may make of its physical resources, its coal and ores, or even of the precious soil, than any unnecessary or avoidable destruction of its organic species. They will require these creatures not only for the advance of knowledge in general, but for much they have to learn concerning the safety and development of the mind and body of mankind. It is, for instance, evident that, in studies yet to be made as to the nature and modes of prevention of human diseases, many species of animals are to contribute largely to knowledge as to their nature as well as to the means of prevention. Two out of the limited number of our domesticated animals, by their physiological characteristics, now preserve us from two of the most fatal maladies. The cow has by the method of vaccination effectively relieved us of small-pox, and the horse is the only available creature for producing the antitoxin of diphtheria. Thus we see that, with the next beast swept away, there may go the possibilities of help to life as well as to learning.

"The ways in which we and our heritors may best deal with this difficult problem of making over the surface of the earth with the least possible destruction of its indigenous life have been the object of serious study by many scientists. The arrangements to attain this end cannot be made at once, they must be gradually developed, as required by the advancing needs. What is, however, needed at once is a sense of the situation, a clearing away of the primitive childish notion that the marvellous life of this world is fitly to be taken as a toy for man, to be carelessly rent away with his plough, or slain for his diversion. The establishment of a truly civilized state of mind, as regard man's duty by those creatures of all degree who share life with him, is the necessary foundation for such conduct as will keep our race and time from shame in the age to come."—*Man and the Earth*, by Nathaniel Southgate Shaler, (Duffield & Co., New York), pp. 207–208. 1917.

IS WATER A NECESSITY?

How long can animals go without water? The answer to such a question is sometimes invaluable aid to the science of game management. Water is a necessity like food, shelter and safe retreats from enemies. It is a factor of major importance in the selection of a game refuge. There is reliable evidence, however, that animals can go without water for long periods when green deserts have been found many miles from water holes and apparently have satisfied their thirst by eating succulent plants. The same may be applied to deer. Sheep resemble deer in many respects. Recently in the Lassen National Forest a band of 1500 ewes and lambs went for 26 days without water. This sustained period was undoubtedly possible because of the succulent forage consumed.

CONSERVATION PROBLEMS

It is true that natural enemies, disease and starvation raise havoc with wild birds and wild mammals, but these ills our wild friends have always had to combat. But think of man-made destructive agencies that man had added—guns, traps, snares, poisons, trained dogs, decoys, sneak boats, sink boxes, blinds, motor boats, automobiles, airplanes, baited waters and fields. And then we wonder why our wild life is disappearing.—*Montana Wild Life*, November, 1930.

WHO PAYS THE BILLS?

Some day the great mass of people who hunt and fish are going to wake up to the fact that they are not going to be able to have twenty dollars' worth of fish and game for two dollars. Every passing year sees a nearer approach to an artificial supply of fish and game, if the demands of a growing throng of sportsmen are to be anywhere near satisfied. This artificial supply costs money. The question is: Who pays the bills?

The natural answer to this question is: The class that derives the benefit. Sport today in almost any form is expensive. Hunting and fishing are by no means the least expensive as most people follow them. If an adult trout costs a half dollar to raise and a man thinks he's entitled to fifty in the course of a season, just how does he expect to get them for a dollar or two? If it costs a state seven dollars to raise and liberate a pheasant, just how can the sportsman

expect to get six for two dollars and a quarter? If some day it dawns on the sportsman that it really can not be done, then the next thing he will do will be to ask who is going to pay the balance.

The restoration of fish and game in this country is going to be a costly undertaking. Money is coming from somewhere if the work is to be done. Someone will have to foot the bills either in cold cash or its equivalent, work.

In the meantime those who realize that fish and game restoration is necessary and also that it costs money are casting about for means of raising the funds with which to work.

One of the first suggestions is always the idea of raising the cost of hunting and fishing licenses. That, however, defeats the fundamental purpose. If hunting and fishing are wholesome, health-giving pastimes, then we will be a better nation of people in time to come if a quarter of our population follow these sports instead of one-tenth.—*The Journal*, Reno, Nevada.

POISON CAMPAIGNS DANGEROUS

It is an extremely dangerous practice to place poisoned meats in an endeavor to control animal or bird pests.

In many localities where such methods have been practiced the greatest toll has been taken among valuable dogs. The loss of these trained dogs has proved to be a greater detriment to control measures than the good elicited from the spreading of the poison.

Persons who are qualified to utilize the poison method are few and far between. It not only requires a knowledge of the life habits of the pests in question but also a technical understanding of the values and strengths of the poisons to use.

Often times an appeal is made to the division to send trained hunters into a locality where a predatory animal, especially the mountain lion, is causing great damage. If the hunter learns that poisoned meats have been spread he will, as a rule, not take his valuable dogs into the district; it is easy to understond that such a move would be utter folly.

Trying to control animal pests in our towns and cities by the poison-meat method is even a great deal more dangerous than the open-country practice. Here human life is jeopardized, especially among the child population. Valuable watch dogs and pets also fall a prey to the method.

The city of Martinez, Contra Costa County, has just experienced a siege of indiscriminate poison spreading. Although no human lives have been taken to date, the casualties among the licensed dogs of the city have been large.

Authorities of that city are at a loss to explain the reason for such a poison campaign by unknown persons. An efficient pound system has kept Martinez free from stray dogs, there is no rat problem to solve and the only other animal that would be eligible for such a campaign would be the cat.

To kill off fine hunting dogs and pets in an endeavor to rid a city of cats seems like a criminal practice. Stray cats should be eliminated for the sake of birds, disease and other reasons but sane methods should be chosen for such work.

Don't take the stray cat out into the country and turn him loose—to prey on quail and other birds that nest on the ground. In the towns and cities the pound master is equipped to handle the situation in a painless and humane way. In the country the rifle or shotgun is by far the quickest and most satisfactory method of ending the depredations of the stray cat.

If you are uncertain, get expert advice from city authorities or game wardens in the district.

POCKET GOPHER DOES DAMAGE

The damage done by the pocket gopher in California is estimated at $8,000,000 a year, according to the monthly bulletin of the Department of Agriculture. Citrus and other fruit trees, as well as many field crops, suffer from the depredations of this pest. It is estimated that 80 per cent of the losses of young roadside shade trees are caused by these rodents.

NEW PICTURE REEL OF ANTELOPE

Pronghorned antelope in California have just been recorded on motion picture films by E. S. Cheney, photographer for the Division. The pictures were taken in the northeastern part of the state.

The trip, just completed, was the second made in the past few months by Cheney to obtain visual records of these elusive big game mammals of the state. Pictures, not yet released, show that excellent results were obtained.

These animals were once very plentiful in California. History says that the great valleys of the state once supported hundreds and maybe thousands of antelope. Being exceedingly wary and swift of foot the animals were enabled to combat all forces of nature except man.

With the discovery of gold in California hundreds of fortune seekers swarmed into the state. Naturally they relied greatly on the fish and game for sustenance.

Disappointed in the gold fields many turned to agriculture. This resulted in

the erecting of fences, the destruction of natural forage, tilling of the soil and the crowding of the game from natural habitats.

By the year 1900 it was discovered that the pronghorned antelope had been reduced to very small bands in six widely separated areas. Steps were immediately taken to protect these animals from complete extermination and close watch was made by the Division for game poachers.

Cheney, during his recent trip, made note of the size of the bands to be found. It is his opinion that there is a small increase in the antelope population. This increase, however, is coming very slowly, he reported, because in the bands surveyed he saw very few young animals.

The pictures obtained will form an invaluable record for the files in the division. When released these films will be shown by the bureau of education to schools, colleges, lodges, sportsmen organizations and other educational agencies. The division not only hopes to present valuable data in this way but also to create a real interest in our native mammals.

In making the picture it was necessary for Cheney to hide in a tree, approximately 40 feet above the ground. He experienced extreme difficulty in handling his equipment secretly in such a perilous position. However, he succeeded in gathering some excellent photographs before he was discovered—then the fleet antelope bounded across the rough country with the grace of great birds. Other pictures were made from surface blinds.

DUCKS IN CALIFORNIA

Some idea of the supply of ducks that this state once supported can be gained from a story appearing in the September number of the *Associated Sportsmen*, under the heading, "Our Ducks." The writer of this story says that he got his data from the notes of John Exley.

The story, in part, follows:

"Forty years ago ducks in California were like the grains of sand along the seashore—they were countless. Sportsmen who believe they have seen many ducks at any time during the last ten years can have no conception of the tremendous numbers that existed in the old days. Hunters of that period laughed at the idea of possible reduction, let alone extermination. "That would be impossible," they said, "so long as there was feed there would be millions and millions of ducks and geese." So we slaughtered game thoughtlessly and without any qualms of conscience.

"Forty years ago you didn't have to go far for a bag of ducks. If you lived in San Francisco all that was necessary was to cross on the ferry to Alameda or to drive to South San Francisco. If you were an experienced duck hunter you could readily kill from 25 to 100 birds in a day within five miles of the ferry building. Bluebill, canvasback, sprig, widgeon, teal, rail, shore birds and bay ducks of all kinds were plentiful in the bay region at that time. The Alameda, San Mateo, Sonoma and Suisun marshes supported a tremendous number of ducks.

"You didn't bother with decoys then; it wasn't necessary. You picked out a line of flight and shot as long as your shells lasted. I recall bags of more than 200 ducks to the gun being made in a day under favorable conditions in this territory.

"In spite of the great abundance of game at San Francisco's back door there were localities in the state where game was even more plentiful, particularly in the Sacramento and San Joaquin Valleys and the delta country. And when Miller & Lux developed an immense tract of irrigated land in Merced County about 35 years ago that territory quickly became the great duck Mecca.

"Confession is good for the soul, they say. When I was a young fellow I was crazy over hunting—it was the sport constantly in my mind. I wasn't satisfied with a day's sport in a week. So in company with several other young blades I launched forth as a market hunter. Many other ardent hunters were doing the same thing, and being thoughtless and fortified with the general opinion that wild game would never become less plentiful we felt justified in our undertaking. Recent reports from the Los Banos country had set our blood afire. So we organized a party, bought a hunting outfit, including camping equipment, a double team and buckboard, "bull guns" and ammunition, and started for duck heaven. It took us four days to cover the mileage now covered in four hours by present-day shooters. When we arrived we added a couple of steers to the outfit, for most of our shooting was to be done with four-gauge muzzle-loaders on ducks and geese "worked" from behind cattle.

"All the members of the party were extra good shots with ordinary shotguns, but the proper use of the "bull gun" was something else again, while the working of ducks with the aid of a steer required great patience and was considerable of a science. But when you get the ducks closely massed and within range, after maneuvering for possibly an hour, it was slaughter—the big gun mowed a long lane through the birds, and two shots

netted the shooter from 50 to 120 ducks, or up to 75 geese.

"On a quiet winter day, from all over the flooded plains would sound the sullen boom of the big guns, for a number of outfits were at work throughout the season. Market hunting was really hard labor, but it was exciting in a way, with an element of chance, both as to the amount of game killed and market receipts therefrom. If we were lucky we netted $1.25 per dozen for sprig and about $2.75 a dozen for mallards. Teal netted about 85 cents a dozen, while widgeon and spoonbill were ordinarily a glut on the market and were reported "spoiled" as often as not. In fact, a larger proportion of ducks and geese shipped out of the valleys were reported spoiled, legitimately and otherwise, by wholesale game dealers who received them.

"In spite of the hard work, I loved to be out there on the wide plains, in the midst of that great seething mass of wild life. If the occupation was degrading it did not seem so to me at the time, nor did it become monotonous. Great armies of wild fowl poured into the region from time to time. Those were the days when the coming of new northern flights were sights to witness and to stir the blood—not merely a few thousand birds, but actually millions; they filled the heavens; the roar of their wings was like thunder; they came in endless procession; flock after flock as far as the eye could see; when they finally massed they covered acres and acres, and the sounds they made were deafening. You saw great banners of geese, too, sometimes miles in length, and the air resounded with their cries. It was nothing to see from 25,000 to 50,000 geese in a single flock, like a great white or gray carpet on the plain; you might see a half-million geese in a day then. And as you lay in the tent under warm blankets you heard the passing of great bird armies in the night and the high-pitched yelping of coyotes early in the morning, like an alarm clock, after they had fed on duck entrails near camp.

"Very often, for variation, we put aside the bull guns and used our "popguns"—10 and 12 gauges—particularly when heavy, regular flights were on. All hands were good shots, and the rivalry was keen as to who would kill the greatest number of ducks with a specified number of shells. Constant practice, together with natural ability, was responsible for unusual skill, not only in long range shooting, but in making doubles and crossing shots. We often killed 100 or more birds to the gun this way during a morning or afternoon flight.

"We did not confine operations to Merced County, but, like the nomads we were, covered most of the big duck shooting areas of the state. In the course of a few seasons, however, the shooting fell away badly—the decrease was very evident. Some localities were completely shot out; in others reclamation drove the game away. We felt that something was happening, but just as the sportsmen of today seek alibis for the decrease of game, we attributed it to everything but gun slaughter. Finally results were so poor that market hunting for us was a losing proposition. We were against night shooting on general principles, but mainly because we knew it drove ducks out of the country. So several years before market hunting was prohibited by the legislature we quit the game for good, through necessity rather than through conversion or virtue.

"We are told once more a great drought has invaded the breeding grounds of the north. What will the story be this year? The decrease was rapid, if not alarming, during a period of more than 30 years, when practically normal breeding conditions prevailed. Will the bottom drop out entirely under this added handicap of drought, or will we be able to maintain a fair number of ducks for future sport? I hope so, as I still like to get out where the wild duck holds forth and to bring in a moderate bag. I'm satisfied with a dozen birds or less now, when once I aimed at slaughter—I now know all too well that I share in the responsibility for the great decrease of game in California."

After reading this interesting story it is not hard to visualize the march of an oncoming civilization, crowding and pushing nature's living birds and animals farther and farther from the face of this land. Statistics show that California has gained nearly 6,000,000 population in the past eighty years; there is now, roughly speaking, about 150,000 miles of road and highway readily accessible for automobile traffic; Department of Commerce officials estimate that there are about 1000 airplane landing fields on record, and millions of dollars are invested annually in sporting goods equipment—think of what these few factors mean, alone, in fish and game conservation problems.

It would often seem that many of us do not realize the complex problems connected with this work. When the first white man set foot on the soil of this continent he started to create a change. As man multiplied the change in nature's plan spread out as oil upon the water, until today we have an entirely different continent, from a natural standpoint.

In this work of conservation it is a waste of time and energy to try and arrive at conclusions through comparison with other periods in history. It is a problem worthy of the effort of the most constructive critic and should be dealt solely from a cooperative standpoint.

DEER KILLED IN MORNING

Most of the deer killed during the past season were taken between the hours of seven and ten in the morning.

Although the season has long since closed, the above fact was recently learned in a table compiled by J. S. Hunter. The purpose of the table is to get an idea of the habits of the hunter instead of the usual data on the animals alone.

It has always been the general belief that the majority of the animals were taken early in the morning and late in the afternoon. The table, which is compiled from returned deer tags, gives accurate data as against theories.

The lowest ebb in the hunting day occurs between the hours of 12 noon and 3 o'clock in the afternoon, the table shows. The game bag falls off in a direct line from 10 o'clock in the morning until noon and then holds about the same until 3 o'clock, from then on there is a slight rise that lasts until 5 o'clock, followed by a direct falling off for the remainder of the hunting day.

The total bag for the season is 24,132 animals. This is an increase of 2910 deer, or 14 per cent more than for the season of 1929. The animals were all said to be in prime condition this season, with a very few exceptions.

Three counties were well above the thousand mark in the deer-bagging activities during the past season. These counties include Mendocino with a total bag of 1483 deer; Siskiyou with 1372 and Modoc 1129. Of course there were many other counties in which excellent kills were reported.

And probably many persons will say, "What of it?" after reading of the compilations. In answer it might be well to add that much valuable information has been gained from the tables and this material will be available for application to deer conservation problems.

MULE DEER HUNTING ON THE MODOC

Anyone who has not spent some time traveling among the camps of mule deer hunters in the Modoc region can scarcely realize the enormous "kick" which these people get out of the sport. To thousands of Californians from all parts of the state and from all walks of life, the mule deer hunt in the Modoc Forest is their big annual vacation. These sportsmen, many of whom come back year after year to the same camps, deserve a great deal of credit for their deep interest in game conservation. Ninety-five per cent of them are more than anxious to observe all state and federal rules and requirements in the woods.

At least 6000 mule deer hunters were camped in the Modoc region on the opening day of the 1930 season. As successful hunters moved out, others came in to fill the gaps, so that this number was fairly constant for at least the first ten days of the season.

Records show 1129 tags turned in to the State Fish and Game Commission covering bucks killed in Modoc County, but since the Modoc Forest has a large area lying in Lassen and Siskiyou counties, it is estimated by forest officers that at least 1350 deer were bagged within the Modoc National Forest during this season, approximately the same number as was taken out in 1926, the last year in which a two-buck limit existed.

The mule deer range in the Modoc Forest is practically all accessible by auto, which makes hunting easy and simplifies patrol. On account of this accessibility, back in 1925 both state and federal officers believed the mule deer doomed to extinction in northeastern California. Legislation, however, came to the rescue. Creation of a new game refuge in the heart of the mule deer territory, the laying out and later extension of District $1\frac{3}{4}$, elimination of the shooting of forked horns, the one-buck limit, and the adoption of the tax system have all played a big part in mule deer protection. Today, these same men hold a much more optimistic view for the future of the mule deer. Forest officers from all sections of the Forest report that the mule deer, if not actually increasing in numbers, are at least holding their own, in spite of the annually increasing number of hunters invading their domain.

After five years of registration of hunters in their camps by means of special patrol, officers of the Modoc National Forest are fully convinced that this method is the best means of handling sportsmen during the deer season.

The notebook form "Report on Campers and Sportsmen," designed by Modoc officers, fills every need and is used by regular local game wardens as well as Forest officers. It gives the location of camp, hunter's name, address, his car make and number, hunting license and deer tag number, condition of camp, checks fire permit, nonsmoking, shovel and ax requirement, a space to note the bagging of a buck and room for remarks. It is sometimes invaluable in cases of

game or fire law violations and is also well liked by the hunters themselves since they can be located by means of the duplicate slip in case of sickness or trouble. All permanent officers carry this form during the open deer season, whether engaged on camp patrol or not.

The system of patrol carried on during the open deer season on the Modoc National Forest, which was started primarily as a fire protection measure, has not only given a better check on deer hunting in general, but has also put us into closer touch with the ideas and opinions of the sportsmen themselves, in addition to presenting an opportunity of inculcating the message of game and timber conservation into the minds of thousands of people who might not otherwise be easily reached.—William S. Brown, U. S. Forest Service, Modoc National Forest, California.

BEARS IN CALIFORNIA

Twenty-two per cent of the bear population of this country is in California. In all there are approximately 52,231 black and brown bear in all the national forests of the United States. It has been revealed that 11,200 of these animals are in this state.

UNITE TO PROTECT WHALE

Japan would unite with the United States and any other country to protect the various species of whales for a number of years in order that the mammals might be studied and given a chance to multiply. Japan complains about the continued diminished whale products in her country, according to representatives of fish exporting firms at Seattle, Washington, who sell whale tails and canned whale meat in the Orient. In Japan the gray whale has disappeared. There has been a noticeable decrease year after year of right, fin-back and humpback mammals found in the sea adjacent to the island empire. Japanese whalers have been forced to take long voyages into the Arctic and far south into the Antarctic to seek supplies for their industries.

STRIPED BASS IN CALIFORNIA

The California State Fisheries Laboratory has recently issued a publication entitled "An Analysis of the Catch Statistics of the Striped Bass *(Roccus lineatus)* Fishery of California," in which the author, J. A. Craig, gives a comprehensive discussion of catch figures in general and a detailed analysis of the striped bass catch per unit of fishing effort during the years 1920–27, inclusive.

This report should be of interest generally but particularly to both sport and commercial striped bass fishermen in the San Francisco Bay region, as it settles for the present the controversy as to the abundance of this species in the above area.

Craig, who is one of the pioneers in California in the field of catch analysis by unit of fishing effort expended, gives, in the first part of the paper, a complete discussion of the various methods employed in analyzing catch statistics and some of their failings. A review of the history of the striped bass in California, since first being introduced in the waters of California in 1879, is also presented.

The study of the daily boat catches per unit of effort is divided into two analyses: (1) using a selected group of boats; (2) employing a random sample of boats. The author sets forth step by step the analyses, describing the methods used and presenting results in the form of tables and graphs. These two methods of analyses are compared, and a discussion is given on other factors affecting the analyses, such as the shad and salmon catches. Craig concluded that both the analyses showed virtually the same condition of the fishery but that the one using a random sample of boats would be of more use if the analysis were carried on in the future; and that the striped bass fishery was in a healthy condition up to 1927.

Copies of this report, Fish Bulletin No. 24, can be obtained by writing to the California State Fisheries Laboratory, Terminal Island, California.

FISHING AREAS FOR THE CALIFORNIA SARDINE

The major areas in which sardines are taken in California waters are largely determined by their proximity to the packing plants, but the specific fishing localities within these areas are dependent on other factors. Where these localities are and their significance to the industry are discussed in Fish Bulletin No. 25, "Fishing Areas Along the California Coast for the Sardine *(Sardina caerulea)*," recently issued by the California State Fisheries Laboratory.

In the Monterey region as shown by Milton J. Lindner over a ten-year period from 1919 to 1929 the fishing area has expanded to the northward. Until 1926–1927 fishing was practically confined to Monterey Bay, but in the later seasons fishing extended as far north as Half Moon Bay, and since 1929 Monterey fishermen have gone as far as the Farallon Islands for their catches. Each season in the late fall and early winter the Monterey area experiences a period of scarcity of

fish. The duration of this period of scarcity has increased in the later seasons and during this time the fishermen cruise over the widest area to locate their schools of fish. Although there has been an increase in the fishing effort, the quantity of sardines taken in the original fishing grounds near Monterey has remained fairly constant since 1923–1924. The increased catch has been supplied by the regions farther from the port of Monterey.

The San Pedro region as indicated by Frances N. Clark has experienced a similar expansion in the same time interval. Fishing was originally confined to localities near the mainland from Point Dume to Point San Juan. The first expansion occurred in 1925–1926 with the introduction of purse seine boats. Since that fishing season sardines have been taken around all the Channel Islands and off the mainland as far south as Oceanside. During the fall portion of each season the major part of the catch is taken to the north of Point Vincente, but in the winter and spring a greater percentage of the catch is taken south of this point. The number of tons of sardines taken in the original mainland section has remained relatively constant since 1922–1923, and to meet the increasing demand for sardines, fishermen have been compelled to cruise over larger and larger areas.

Three distinct sizes of sardines are taken at San Diego: young fish, termed by the trade "quarter-oils"; intermediate sized fish or "half-pound"; and adult fish or "pound-ovals." The fishing localities for each of these sizes are shown by H. C. Godsil to be distinct. The quarter-oils are taken in greatest abundances adjacent to the sandy beaches of Coronado Strand and La Jolla. The half-pound fish are caught in the inshore region throughout the fall, but in the winter they may be found at a greater distance from shore at almost any point along the local coast line. The pound-oval fishing area extends from Los Coronados Islands in the south to Point La Jolla in the north.

Anyone interested in this publication may secure a copy by writing to the California State Fisheries Laboratory, Terminal Island, California.

DAILY AVERAGE LENGTHS OF THE CALIFORNIA SARDINE

During each fishing season the sizes of sardines caught in California waters undergo definite fluctuations. The details of these changes in the San Pedro area and the similarities and differences between size changes at Monterey, San Pedro and San Diego are discussed in Fish Bulletin No. 26, "Seasonal Changes in the Daily Average Length of the California Sardine, *Sardina caerulea*," by Frances N. Clark of the California State Fisheries Laboratories.

Throughout a fishing season the daily average lengths are small during the fall months, increase to a maximum in the winter and decrease slightly in the spring. The transition from smaller to larger averages occurs about a month earlier at Monterey than at San Pedro. The average lengths of the fall fish at Monterey are greater than of the fall fish at San Pedro. The winter averages are very similar for Monterey and San Pedro while San Diego averages resemble Monterey more closely than San Pedro. For the ten seasons' studied, 1919–1929, the averages during the second five-season interval were greater than during the first five. This probably resulted from the presence in the catch of dominant size-groups which reached a maximum size during the latter period.

These seasonal changes in daily average size have a direct effect on the industry. More fish are packed in a pound-oval can in the fall months and fewer in the winter. Because of the increase in average sizes in the later seasons, the numbers of fish packed in a can have averaged less than in former years.

The only explanation for these fluctuations in average length within a season, which satisfies all conditions, is the movement of different sized fish into and out of the fishing areas. The occurrence of the same size fluctuations at Monterey and San Pedro, with a month's difference in the dates of the transition from small to large fish, suggests a definite relationship between these movements in the two localities, although the positive demonstration of such a relationship is not possible as yet.

Copies of this recently issued report may be obtained by writing to the California State Fisheries Laboratories, Terminal Island, California.

IMPORTANT CONFERENCE

A conference of importance to our fisheries investigations was held at Pacific Grove, October 6–8 and attended by N. B. Scofield, Tage Skogsberg, W. L. Scofield, and five other members of the laboratory staff. The purpose of the meeting was to correlate hydrobiological work of the Hopkins Marine Station with the work the laboratory is doing on fisheries, especially on sardines and mackerel.

The discussion was opened with a summary of the work at Pacific Grove by Dr. Skogsberg. E. C. Scofield and Milton J. Lindner outlined their work on the early stages of sardine and mackerel.

SPORTSMEN PLANT CLAMS

On one of his recent patrol trips, Deputy Ed Glidden of San Diego, noticed an abundance of small Pismo clams on the beach from Coronado to Del Mar. They were readily identified as *Tivela stultorum* and as a result of his investigations, Deputy Glidden has reported as follows:

"Personally, I believe the sport fishermen to be responsible for the stocking of these clams. A number of years ago, these clams could be bought in the open market and were much sought after by surf fishermen, with the consequence that after the fishing was over, oftentimes bait would be left and as the clams would still be alive, would be thrown into the surf."

As a result of these plantings, the beaches in San Diego county are becoming stocked with Pismo clams.

WINTER WORK AT HATCHERY

Winter activities are in full swing at the Big Creek trout hatchery of the Division. The work consists of cleaning and disinfecting, painting and repairing of the buildings and fish troughs. This hatchery is located on the creek that bears its name, one-half mile above its junction at Scott Creek egg-collecting station in Santa Cruz County.

Results from this hatchery have been very satisfactory. Built in 1927, additions have been gradually made until there are now 56 hatching troughs in the main building.

Reports show that about 5,000,000 eggs were handled at this place during the past season. Besides hatchings and experimental work carried on at this location with steelhead trout, egg shipments are made to various other hatcheries in the state.

Real "fish" activities will not begin at Big Creek until about the middle of January. At this time the steelhead trout generally enter the river on their way to the spawning grounds and are eligible for egg deliveries.

FISH RESCUED

Working hand in hand with employees of the city and county departments in Los Angeles, Captain Chappell and Deputies Bedwell, Towers and Thornburg have been busily engaged in rescuing bass and sunfish in Chatsworth reservoir during the past two weeks. Chatsworth reservoir, which is being drained in preparation for some construction work, offered an opportunity to stock other waters in southern California with these gamey fish and to date nearly thirty thousand adult bass and sunfish have been transplanted under permits issued by the Department of Fish Culture in Puddingstone reservoir in Los Angeles County and Lake Elsinore in Riverside County. The stocking of these waters will afford some added sport to the angler in southern California and credit is extended to the water and power department of the city of Los Angeles for their aid in rescuing fish and to the Los Angeles County Department of Forestry and the Clevelin Realty Company for their assistance in transporting the fish from Chatsworth reservoir.

FISH TRAVEL GREAT DISTANCES

A rainbow trout tagged at Port Washington, Wisconsin, on July 14, was caught seven days later near Grand Harbor, a distance of 200 miles around the shore line of Lake Michigan. If the fish had traveled straight across the lake the distance would be 87 miles, thus allowing an average of twelve miles per day. By traveling the shore line the fish would travel a distance of 37 miles per day.

A Pacific salmon was marked by the United States Bureau of Fisheries in Alaskan waters and was caught 44 days later 1300 miles away in a Siberian stream. Fishermen who return these tags to the bureau receive 25 cents to $1, depending on the species of the fish.

MEASURES CLAMS

When you go clam digging be sure to take an accurate, flexible rule. Nails properly spaced on the clam-rake handle make an excellent gauge—one that can not be lost and thus cause the digger to do some "unlawful" and expensive guessing.

Regulations show that clams of lawful size must not be less than five inches across at the greatest diameter. Persons who take undersized shellfish will be arrested and prosecuted regardless of excuses.

Forrest J. McDermott, deputy commissioner in the Santa Cruz district, declared that many persons come to the clam beds without the proper measuring equipment. Although they can not be prevented from digging and taking the shellfish, they are being closely watched for violations.

BRUSH FIRES DESTROY GAME

Brush fires took their toll of wild life during the month of November in Ventura, Los Angeles and San Diego counties. In a report received from Deputy Emerick of Ventura he writes as follows:

"The Tapo and Potrero fires burned approximately 63,000 acres of forest and brush cover. We had some of the worst weather I have seen for a long time. These two fires took a heavy toll on valley

quail. I judge there were at least 15,000 birds destroyed. Most of these were on the Newhall ranch, Doheny ranch at Santa Susana and the Strathearn ranch at Simi. There were lots of quail in all these localities. The fires burned heavily at night and the quail had no chance. There were a few deer destroyed, no doubt, and I have a report of some five or six that were found burned. I would judge that at least twenty were so killed.

The Pacific Western Oil Company, who now have this Doheny Tapo ranch, are putting out six or eight bales of hay a week for the deer on their property; also a lot of grain for what quail are left.

SEND SPECIMENS

It is important that birds, fish and game animals found dead or sick from unknown causes be sent immediately for examination to Dr. K. F. Meyer, G. W. Hooper Foundation, Second and Pernassus avenues, San Francisco. Don't hesitate to make inquiry.

The following instructions will help to bring the subjects to the Foundation's laboratory in good condition:

1. Don't send them in so they will arrive in San Francisco on a Saturday or Sunday. Put your specimens in cold storage and send them so they will arrive the first of the week, if possible.

2. Send specimens on ice, if possible, and if not possible to do this wrap them up in several layers of paper and keep them from the air. Use a small box when necessary.

3. If the specimen has already started to smell, or spoil, it is hardly worth sending, as little can be determined when subjects are in such a stage of decomposition.

4. Don't remove the intestines. They are often the source of diagnosis.

5. The main thing in the sending of specimens is SPEED—the more the better.

6. Those who send in specimens will receive a prompt report on the findings as soon as the Foundation experts can establish facts.

DUCKS IN CALIFORNIA—MALLARD

Are you familiar with the types of ducks that come to your state every year? Many persons, including hunters, often get a string of the prized waterfowls and are at a loss to name the birds readily. It is the purpose of the following material to offer an understandable description of one of the favorite game ducks—the mallard.

Mallard ducks are a migratory waterfowl that live in marshy areas. We have large numbers of these birds that remain in California the year around and these in turn are augumented in the winter season by the birds that come down from the northern nesting grounds. The chief local nesting grounds is along the deep sloughs and larger ponds in the Sacramento and San Joaquin valleys.

The mallard duck is one of the most beautiful of the duck family. The head of the male is silky green with a trim white collar: the speculum, or colored area on the wings, is purple with black and white edges; the chest or frontal region of the bird is tinged a beautiful chestnut brown; the back and main portion of the wings is gray, and the black upper tail coverts curl upward into a ring.

The female of the species, like most other members of the bird family, has less conspicuous coloring as a protective means during the nesting season. That is, the bird is so colored that she will "melt" into her surroundings and is almost impossible to see until approached very closely; she also "freezes" and will not move from her nest until almost stepped upon. Her coloring is mottled and streaked in brown; the speculum is purple as in the male members of the family.

These birds present a very formidable appearance while in flight. They appear extremely large and heavy and fly with great speed. When the wings are spread the white underside is quite noticeable and the spread tail of the male shows a band of white.

Because of the peaceful habits, these birds are easily domesticated. Many varieties of barnyard ducks are direct descendants of the beautiful mallard. They are generally seen in pairs and appear to be very devoted to each other. The birds avoid salt and brackish water as much as possible and for this reason will adapt themselves quickly to fresh water lakes, ponds, rivers, etc.; because of the advanced development in irrigation in the great California valley many mallards have been noted nesting in alfalfa fields and along irrigation ditches.

Mallards build their nests out of grasses and pliable stalks. They are rather large affairs and are occasionally lined with feathers or other soft material. As a rule six greenish-white eggs are laid and these are hatched in about four weeks time. The female tends to all the functions of the nest while the male loiters in the general vicinity.

In California the breeding season generally extends throughout the spring months and on through the month of June. During this season the males are moulting and the plumage is much similar in color to that of the females—this

is probably a natural protective measure. After the ducklings are hatched, take to the water and are full grown, the male rejoins his family and swims around in his full "bloom" of color as though he did all the fine work of rearing.

The young ducklings go through a very dangerous period until they are full grown. At this time they are subject to attack by owls, hawks, snakes, minks and other birds and animals and many perish from such causes. Naturalists declare that the tiny birds are often attacked from beneath and pulled under the surface by turtles and large fish for food purposes.

A flight of mallards in a pond create a great deal of noise. One has to hear the familiar "quack" once and the sound can thereafter be distinguished quite easily. When startled they jump directly into the air, clearing all obstructions, and fly off with great speed. The wing action is very rapid and the birds generally fly high; the birds are easily deceived by decoys and will quickly wheel and land among the artificial ducks.

These birds feed principally on vegetable matter; seeds of aquatic plants, grain, grass, crustaceans, mollusks and insects. They do not dive for their food but swim around in the shallow water, tilt or "stand on their heads," hold this position with their paddles and sift the soft mud through their bills.

Of all the ducks that migrate yearly into California the mallard is, without doubt, the most highly prized bird. And California seems to be more fortunate this year than many other localities in that the duck migrations are continuing. Of course ducks are not as plentiful as they have been in former years and this, according to the Biological Survey, is caused by a duck shortage in the breeding grounds.

California has not experienced the severe droughts that have ruined the duck marshes and ponds in other sections of the country and an unusual influx of hungry birds is expected after the real winter weather sets in. For this reason the Division of Fish and Game in cooperation with the Federal Government and true sportsmen's organizations, is doing all in its power to prevent an abnormal hunting of the birds—these organizations are working on the plan that the more ducks spared for nesting purposes will mean more ducks to return in future seasons.

GOOD DUCK HUNTING REPORTED

Good hunting reports have been coming in from various duck clubs throughout the state. The birds are reported to be in excellent condition.

Extremely cold weather in the northern feeding grounds is said, by many hunters, to have caused the improved shooting conditions. With the feeding ponds covered by a layer of ice and snow the birds were forced to migrate to a milder climate. California is believed to be the objective of many of the flights.

And with the knowledge that the birds are unusually scarce this season, many of the gun club managers are taking extra precautions to see that the ducks get an even break. Every effort is being made to provide good hunting but duck slaughter is absolutely prohibited.

Many of the well operated clubs provide a resting pond for the birds. This resting pond might be termed a sanctuary within the club grounds where the hunted ducks can find protection from the shooters. Such a plan prevents the flights from becomming demoralized and scattered and assures a constant supply of birds near at hand.

Most of the gun club operators warn their guests about the folly of long-range shooting. It has been estimated that for every limit of ducks bagged, a like number escapes, wounded, to die or become the prey of marsh animals.

Ninety per cent of the cripples are caused by this long-range, "gun-stretching" practice. A good hunter will always wait until the flight is within range, select his bird or birds and make his shots count.

To shoot before the birds are within range not only causes a large percentage of cripples but prevents the good hunter from getting a shoot. In many clubs the long-range shooter is soon "benched." If this unsportsmanlike shooting could be entirely eliminated the supply of ducks would be greatly increased.

The wise gun club man also eliminates any early or late shooting habits that the hunter might have. In this way he not only assists in enforcing our game bird laws but helps in conserving the duck supply.

DUCK HUNTING AT SALTON SEA

Salton Sea always had a reputation as being the stamping ground of southern California duck hunters. The outlook for this season is very favorable, large flocks of sprig and widgeon have been sighted within the past week. Thousands of acres of barley and alfalfa are grown in this region, thus offering a fertile feeding ground for the birds. The birds have been seen leaving the Sea late in the afternoon, trailing in from the

feeding grounds again during the morning hours. The lower end of Salton Sea is approximately 210 miles from Los Angeles and may be reached over paved highways.—National Automobile Association.

DUCKS IN SUISUN AND SAN PABLO BAYS

Sportsmen have reported that hundreds of ducks have come into the Suisun Bay territory during the first few weeks in December.

The birds are not only settling onto the baited ponds of the various duck clubs but are also ranging through all sections of the marshes. Birds are said to be in excellent condition.

Bay fishermen declare that great numbers of the birds loaf in the deeper open water of Suisun Bay during the day and fly over onto the ponds during the evening hours. They return to the deep water during the morning hours, that is, unless the weather is stormy and the bay rough.

Sprig seem to be the predominating type of bird, although hunters declare that there are plenty of mallard and canvasbacks. Green-winged teal are not as plentiful in some localities this year as in former seasons, reports state.

Many hunters say that they have had some good shooting on San Pablo Bay during the past few weeks. This territory has always been noted as a canvasback field and hundreds of the birds can be seen out in the bay.

Canvasback ducks can be easily detected because they speed through the air with a noticeable whistling sound and hit the water with a splash. They dive in deep water and seldom perch on the shore. The head of the male is reddish brown, shoulders and chest black and the back canvas-white. They appear extremely large in flight, are stockily built and fly with great speed.

N. Y. BANDED DUCK SHOT IN CALIFORNIA

A banded duck, killed three weeks ago by Felix Ariasi, Santa Rosa sportsman, was banded at Southampton, Long Island, New York, March 4, 1929, according to information received here from the Bureau of Biological Survey, U. S. Department of Agriculture. The duck was shot at Grizzly Island, on Suisun Bay.

REPORT ALL BANDED DUCKS

Duck shooters should not lose sight of the fact that the Bureau of Biological Survey is more interested than ever in securing reports of banded ducks that have been killed on California marshes.

Every year the sportsmen of the entire country come to realize that the matter of waterfowl populations is one of more than local concern. If there are poor results on the hatching grounds in the north, it is bound to follow that the shooting on California marshes, which represent the winter homes of the birds, will be poor.

For that reason, whenever a banded bird is found on the game strap, the band should be removed and a note giving the locality where the bird was killed should be forwarded to the Bureau of Biological Survey at Washington. From these returns those in charge of the work are getting a very definite picture of the areas within which our ducks breed.

DUCKS MIGRATE AFTER A FREEZE

Many hunters are of the opinion that the recent storm that covered a large portion of the Pacific Coast will bring more ducks from the north into California.

Although this may be true, there have been no reports as yet which would substantiate this claim. Naturalists declare that temperature changes have the greatest influence on duck migrations.

When snow and ice cover the feeding grounds in the north and the states in the west, the ducks naturally have to migrate to other fields—in the majority of cases out here in the far west the flight generally leads to California. Unless a freeze takes place the ducks usually remain wherever the feed is plentiful.

It is sometimes true that a storm will scatter the ducks and cause some to leave and hunt for milder weather. By this theory it would seem that the ducks that come in from the north at this time would just about balance up for the ducks that leave for the southern fields during the unsettled weather.

There is this advantage, however, the fine rains have filled many of the ponds with good fresh water and this should attract the ducks in larger numbers than have been present so far this season. The real benefit will not be realized until later on when the food growth has had a chance to develop in the freshly filled ponds.

COOTS ARE CLEAN FEEDERS

Coots, or mudhens, are excellent eating when skinned and broiled. To avoid hunting these birds, which are protected by the Migratory Bird Treaty, on the supposition that the meat is not good is unjustifiable.

Allegations that the bird is not a clean feeder and that its flesh tastes like the

bottom of a mud hole are largely unfounded. The coot feeds more upon the green foliage of aquatic plants than do any of the wild ducks, and it consumes in addition such delicacies as the tubers of wild celery and sago pondweed and the grain of wild rice. It is, in fact, a cleaner feeder than many other birds and mammals eaten by man.

Coots come under the same laws that regulate the ducks. If hunters can be made to realize the true value of the meat they will include this game bird in the day's bag and thus prevent an overabundance in a particular species. Rice farmers have complained on numerous occasions that the coot is doing a great deal of damage to crops—the hunting idea is really the most sensible solution to the problem.

Remember, skin the birds instead of plucking them. It will be found that it is much less work to skin a coot than to pluck a duck—it should not be difficult to sell the merits of the coot on this colossal point alone.

AN EXAMPLE OTHERS SHOULD FOLLOW

A fussy little banty hen and Mrs. Fred Gerard of Middletown, California, entered into a partnership during the spring of 1930 that resulted in the brooding and rearing of a covey of orphaned valley quail. During haying season, Fred Gerard mowed over a quail's nest. The mother quail left without cover, became discouraged and left for parts unknown. The eggs, 25 in number, were placed under a banty hen. In due time they hatched and of the fifteen chicks who made their way into the light of day, eleven lived and are now fully grown.

The baby quail for a time were like so many chicks. As they grew older their wild nature came to the fore and they left the hen and took up a permanent abode in a patch of willows close to the ranch house. The band, their numbers swelled by the addition of several wild quail, often come up to the house and will respond to Mrs. Gerard's call at any time.

Mrs. Gerard and her loyal little helper, the banty hen, deserve much credit for the interest shown in the conservation of wild life.—Fred Herman, Middletown, California.

QUAIL EASILY TAMED

The California quail, now the State bird of the Sunshine commonwealth, has never been a very wild fellow. He always responds trustingly to human kindness, and a very strong proof of his friendliness was given during a recent winter in Yreka, Cal. Snows had made the food of the quail very scarce, and the superintendent of streets, Edgar Thomas, supplied food to the birds while they could not find their natural sustenance. So tame did they become that they often came out from their cover in Yreka's auto park on to the state highway in front of the city hall. They were not molested, and one might have thought them to be some domestic breed, so free from fear were they, rather than members of a species that is severely hunted at certain seasons of the year. These birds are distant relatives of the friendly bob-whites that live in the east.—U. F. Brown in *Nature Magazine*, October, 1930.

QUAIL SCARCE ON MOUNT DIABLO

California valley quail are on the decrease in the Mount Diablo district.

This territory was once considered among the best quail country in the state, but during the past few years there has been a noticeable scarcity of birds. The geographical nature of the country in this section makes it an excellent place for the propagation of quail.

The reason for the shortage of birds is rather difficult to explain. Several theories have been advanced which have to do with water and food shortages and poison campaigns on destructive enemies, but so far no definite proof has been offered as a solution of the problem.

It is definitely known that the Mount Diablo country is becoming very popular for hikers and picnickers. This growth is quite evident since the highways were improved in the district.

Just what effect this advance of civilization is having on the bird and animal life of the mountain is not known—naturalists maintain that such a condition is regulated by the attitude of the out-of-door public.

Definite steps are being taken to determine, if possible, the causes of quail shortages in various sections of the state and it is hoped to supply a suitable remedy. Full cooperation of everyone is necessary, however, to carry on a successful program in our fish and game conservation.

QUAIL INCREASE IN SOUTHERN CALIFORNIA

Reports from quail hunters in southern California are very encouraging this year. The reason for the general increase in the birds in this section of the state is largely due to the cooperative work of the wardens, sportsmen's clubs and municipal authorities.

Southern California's fish and game problems are very difficult to handle for many reasons, the main one of which is the tremendous increase in the population. Statistics show that there were 4328 people in southern California in the year 1850. This number increased to 270,820 in 1900. In 1910 the population figure reached 705,225 and in 1920 this figure jumped to 1,277,142.

To a person familiar with fish and game problems the above figures will furnish excellent material for reflection. It must also be remembered that there are thousands of miles of "high speed" highways in this section of the state and that thousands of tourists enter the state via the southern route each year.

It takes a great expanse of territory to "house" such a growing population and this in turn creates a hardship on the wild life that must seek new surroundings.

Improvements in game conditions have been pronounced in southern California since the real seriousness of the problem was realized by the sportsmen and indications point to the establishment of a real standard in the field.

MOUNTAIN QUAIL IN MOTION PICTURES

For the first time in the history of the Division of Fish and Game, mountain quail have been recorded under wild, natural conditions on motion picture film.

The pictures which were taken by E. S. Cheney, division photographer, are now being developed and arranged on a reel featuring upland game birds. If the negatives can be judged for anything, the new reel promises to be one of the most interesting and valuable pictures in the entire collection of the division.

In seeking the pictures, Cheney undertook one of the most difficult problems he has faced since registering game birds and animals. The mountain quail is extremely wary and it took hours of patient hiding in a blind near a waterhole before the birds were "shot" in the open. The pictures were taken in the mountains near San Bernardino.

PHEASANTS NOT DESTRUCTIVE

Pheasants and other birds do not attack melons, tomatoes and berries because they have a particular liking for them, but because fruits and vegetables contain water which slakes their thirst. It is not necessary to use rifle or shotgun to keep the birds away from fruit and vegetable crops if containers with water are placed at convenient points where pheasants and other feathered species are found in abundance.

MORE PHEASANTS NEXT YEAR

Work has already started in preparation for the next season at the state game farm at Yountville. Due to the great success in bird liberations during the past year, it is planned to enlarge the capacity of the rearing pens.

It is planned to carry an extra number of laying pheasant hens in order to supply the number of eggs that will be necessary in filling orders that will come from individuals and clubs that want to raise birds for liberation.

In reading reports from middle western states it is interesting to note that some of them have achieved enough success in raising pheasants to declare a short hunting season. It is also gratifying to note that in such states where a season has been opened, the hunters used extreme care in not abusing the privilege.

It is the opinion of officials of this state that with the proper cooperation of sportsmen and ranchers the time should not be far distant when a short season might be declared here. This is not a promise, however, but merely indicates that what is possible in other states is possible here with the proper interest and help.

It is necessary to get these new Yountville pens in order early on account of the time required in growing the cover crop necessary to make the pens right. The ground is cultivated many times and otherwise cleaned. In order to have green food in the pens we have transplanted 3150 kale plants.

They were extremely fortunate at the farm this year in that the rainy weather came at a time to do the most good. Cover crops were planted and received full benefit of the downpour. All indications point to a banner season next year. Much favorable comment has been received from sportsmen.

WARM WEATHER HELPS PHEASANTS

Although the warm weather has proven to be a severe hindrance to the duck hunters, it has created a big advantage for the pheasant enthusiasts.

Many sportsmen are taking advantage of the situation and are liberating the birds in selected territory. Some of these men contend that the mild weather allows the birds to become accustomed to the strange surroundings before being shouldered with winter protection problems.

Whether this condition bears any weight in the welfare of the birds or not is a matter for debate and much can be

said on both sides of the question. At any rate it is known that the warm weather will not do the birds any harm out in the wild places.

During the past week 16 crates bearing 160 pheasants have been shipped to two locations from the state game farm at Yountville. The birds arrive at destinations in good condition and there were but two fatalities reported.

Eight crates were sent to the J. M. Carson ranch, near Arcata. The birds were liberated in the Arcata bottoms along the Mad River and took to the wilds quite readily.

The other consignment of eight crates was delivered at the Fern Cottage ranch, near Ferndale; this ranch is the property of Russ Williams. These birds also adapted themselves to the new surroundings quite readily and from latest reports promise to become well established.

'TURKEYS DO WELL AT GAME FARM

Turkeys develop very rapidly under conditions at the Yountville game farm. Such a condition is considered quite unusual because of the particular climate in that district although it does prove that the birds will adopt themselves to various conditions.

A recent report shows that one bird which was hatched in April now weighs in access of 30 pounds. This is considered remarkable for this class of work.

It is also reported that one of the pullets from the April hatch has already laid four eggs. The birds are all given the best care possible so that when liberated they will be fortified with excellent physical qualities.

Work of liberating the turkeys is progressing very rapidly. However, before any birds are assigned to a territory a personal survey is made by August Bade, superintendent, to see that proper conditions exist for the welfare of the "green" birds.

Careful check is made of the existing predatory animals and birds, and food and watering conditions are taken into account. By such careful work it is hoped to keep natural losses down to a minimum.

PLANT TURKEYS IN SOUTH

Turkey planting is progressing rapidly in the southern part of the state. The liberations are being made under the supervision of E. D. Platt, superintendent of the state game farm near Chino, San Bernardino county.

Occasionally the liberated birds wander to the ranches and farms near the vicinity of the planting and it has been a problem to prevent these birds from joining the domestic flocks. Farmers sometimes ask for instructions on the art of making the wild birds wilder.

Naturalists explained that the turkey is a native wild bird of this continent. When the pilgrim fathers arrived they found the birds plentiful on the eastern coast and utilized the meat for food. When these early settlers gave thanks for their safe journey across the Atlantic the turkey constituted the principal food at the feast. Thus the turkey occupies an important place of honor in the settlement of North America.

Years of contact with man have tamed the turkey sufficiently to include the bird in our list of domesticated fowls. Also years of indiscriminate hunting have reduced the birds in the natural wild state to a minimum—as a matter of fact the wild birds have been exterminated from many of the natural haunts.

Naturalists know that through carefully planned liberations and protection the turkey can easily be induced to practice its natural, wild habits in the field. Experiments in various places have proven this point.

Several days ago a liberation of 120 birds was made in the Big Pine district. These birds were all raised at the Chino game farm and were not released until the superintendent had made a careful study of the field.

The birds will be protected from unprincipled hunters and predatory animals as well as possible, and close check will be kept on the nesting activities. If some of the birds succeed in raising broods of turkeys in the wild state these flocks will be carefully watched and will be trapped at the proper stage of development.

Instead of holding the trapped birds until they become tame, the game farm attendants will distribute them with flocks of the tame birds and liberate them immediately. It is known that turkeys will follow a leader and that the wild gobblers will generally assume the lead.

In this way the flock will not only be led to a natural feeding ground but will learn to protect itself through the teachings of the wild leader.

Plants are being made in various sections of the southern mountains under this plan and the results are being watched very closely by bird breeders of the state.

TURKEYS IN HUMBOLDT COUNTY

Turkeys have been liberated in Humboldt county.

If ranchers and sportsmen will cooperate as well as they have in the past,

the birds will stand an excellent chance of becoming established.

It will probably take several weeks after liberation before the turkeys become accustomed to the new surroundings. Until that time it will require the careful attention of all persons who come in contact with the birds to see that they receive reasonable protection.

Once the turkeys have gained a foothold and have raised broods they are quite capable of taking care of themselves. A wild bird by nature, the turkey is well equipped to hold his own in the forests and hills.

One of the greatest enemies the turkey has is the "poacher." These lawless hunters do not hesitate to shoot the newly liberated birds, even though the turkeys are half tame, and then as a means of defense they will offer caustic criticism because "nothing has been done to perpetuate a species."

Before turkeys are planted careful consideration is given of the number of types of predatory animals in the selected district. If conditions are found unfavorable for the plant, the birds are not sacrified. Unlawful hunters are quick to place their crimes on the shoulders of some innocent or "imaginary" animals or birds.

MANY DOVES IN IMPERIAL VALLEY

In a report received from Deputy Ed Glidden of San Diego, he writes the following: "It is hard to realize the vast amount of doves in the Imperial Valley. Unless one is familiar with the conditions it would be hard to believe. They are not in hundreds, but in thousands. In a field near Calexico, doves were so thick the field seemed to move. Food and weather conditions are ideal, which holds the birds in this locality. This, I personally believe, is partly responsible for the scarcity of doves in the adjoining counties. We also noticed a number of the Sonora or white-wing doves mingled with the other species. Also saw an albino dove sitting in a willow tree. This dove was pure white and would have made a wonderful specimen. The writer not having a collector's permit, was content with watching it for a period of time. Deputy Little and I estimated 400 blackneck stilt feeding in one field."

DOVES REMAIN IN NORTH

Several sportsmen have reported that they have noticed small bands of doves in the Sacramento Valley during the latter part of November. It is a supposition that drought in the hills has driven the birds down to water and that they are remaining in close proximity to farms and vineyards in the district this season.

It is not unusual to see doves at this time of year in all parts of the valley and even extending up into the mountain territories, according to D. D. McLean, field naturalist. These birds are classed as local birds and do not make the migrations south, as a rule, with the rest of the species.

ASIATIC MYNAH IN CALIFORNIA

Watch for and help exterminate the Asiatic mynah, or house mynah, scientifically, *Acridotheres tristes*, because reports are current that this undesirable bird has been introduced into Los Angeles county. The bird, apparently, has not been found in the wild state in California or the rest of the United States before. It has a tendency to destroy fruits and some vegetables.

The bird is about nine inches in length; the whole head and upper breast are black; the remainder of the body is a Quaker brown and there is a broad white wing bar on the under side which is especially noticeable in flight. Its bill and legs are yellow. There is also a mustard yellow patch below and behind the eye. The sexes are alike in appearance.

The bird's one virtue is that it is energetically insectivorous. Colonies congregate in large numbers and at times are extremely noisy. The United States Biological Survey reports that the mynah is closely related to the European starling, another very objectionable bird.

Presumably some of these birds escaped from some private aviary in southern California. One colony is said to have been found nesting in drain pipes near the roof of an apartment house during the past summer. The United States Biological Survey has placed a ban on the importation of these birds until further notice.

GRASSHOPPERS

Grasshoppers are reported as more or less troublesome over practically the entire country from Connecticut to California, and southward to Texas, according to the United States Bureau of Entomology. Serious outbreaks have occurred in northeastern Colorado and parts of Wyoming, Oklahoma, Nebraska, and South Dakota. They are damaging sugar beets in Utah and small grains in southern California.

Among the new publications issued by this government department is "A Study of the Lesser Migratory Grasshopper," by R. L. Shotwell, assistant entomologist.

Although grasshoppers are foods for various fish, game and birds, they are considered to be devastating pests and the bulletin not only deals with a review of the history and synonyms of the species but recommends control measures such as the use of poison bran mash and cultural practices.

CONCERNING OWL ATTACKS

In a note in *Science* for November 1, 1929, attention was called to the attacking of person in Morgantown, West Virginia, by screech owls, and a vague inquiry was made as to whether others had had a similar experience.

It was not long before the inquiry was answered so emphatically as to leave no doubt as to the fairly common occurrence of this experience.

Several answers appeared in forthcoming issues of *Science*, and the author received personal letters from more than a dozen individuals scattered from Texas to Ontario, Canada. Several of the writers were college professors, two were physicians, one was an eminent chemist, one was apparently a lumberman and the occupations of the others could not be determined from their letters.

Several mentioned specifically the screech owl as the attacking bird; one said the attack was by a great horned owl; one bird was apparently the snow owl, and a few writers did not name the owl.

In most cases the attack was at dusk, though one was at dawn and one on a moonlight night.

Five of the writers said the owls had nests or young near by, and gave that as the cause of the attack. One writer thought the owl mistook the hair on the head of the person attacked for some mammal on which it preyed.

Several persons said that the owl swooped down close to the head, snapping its beak but not actually touching the one attacked.

A majority of the correspondents reported the victim struck with claws or beak and sometimes painfully injured. In one case a lumberjack was said to have "carried a sore neck for a number of months." In another case a Louisiana negro lost an eye by the attack of an owl.

In a certain part of one town policemen were much annoyed by the attacks of owls.—*Science*, Vol. 72, No. 1867, Oct. 10, 1930.

GOAT AND DEER

A goat belonging to a private individual in Florida is of greater value in the eyes of the law than a deer that belongs to the people as a whole. Under the law, the theft of a goat is classed as a felony and conviction for it is punishable by imprisonment for not less than one year, or more than two years, or a fine of not more than $100, or both.

The illegal taking of a deer in Florida that belongs to the whole people is punishable by a fine not less $10 or more than $300, or thirty days in jail, or both.

ADVICE ON CARE OF GUN

This is the time of year when gunsmiths generally find their shops overcrowded with work. In many cases a great deal of this "hunting grief" could be eliminated by a little knowledge on the care of a gun, and, of course, a little application.

W. H. Price, an expert gunsmith in San Francisco, has generously donated the following advice on the subject:

"The cleaning of shotguns, rifles and pistols is such an easy job that most gunsmiths wonder why the job is brought to them. The only necessary tools are steel wool, oil and clean rags, also rods for each. First, wipe out barrels with dry rag. Next cover rag with steel wool No. 0 and rub well, oil on the wool. Next dry rag again followed by oiled rag. Now take oiled steel wool and rub all over outside—this will not hurt blueing. Gunsmiths use steel wool to burnish the blueing. This applies to rifle and pistol as well; no other tricks are necessary. Except in high-power rifles, use plenty of nitro solvent before the final cleaning and oiling. Under ordinary circumstances, this will be enough for all guns.

"Now in case of neglected guns, you may not have the equipment the gunsmith has and in that case you may use plenty of hot water while scouring inside the barrels and finish with a good swabbing, using regular ammonia if the fouling is heavy or of long standing. Do this for a few days before regular cleaning with oil to put away. Use plenty of good oil in all joints and where you can see there is friction. By following these instructions, the only time you need consult a gunsmith is after the season closes. Guns should be stripped and cleaned with good oil to put away; also whenever a gun is submerged, it is best to strip it." W. H. Price, San Francisco, October, 1930.

HUNTERS LIKE DOUBLE-BARRELED GUNS

Double-barreled shotguns are gaining great popularity in the field, according to recent reports coming from the duck hunting grounds. It is also reported that hunters are more careful about observing

the bag limit laws this season than any year previous.

By using the double-barreled guns many sportsmen declare that they are enabled to stay in the field longer to get a limit and that the shoot produces nearly twice as much sport. It is also pointed out that the birds are given a better sporting chance of escape by this method of shooting and that the kill is not so disastrous to any one flight.

A good hunter with an automatic or a pump gun is often able to completely ruin a small flock of ducks. With a two-shot piece such a hunter will pick the two best looking birds in a flight and allow the rest to escape—instead of being absolutely demoralized and scattered the birds will proceed to a place of safety and will become good game for other reasonable hunters in the field in future times.

Naturalists from the Biological Survey, who have been making studies of the duck nesting grounds for the past three years, declare that there is no use in trying to fool ourselves about the shortage of ducks. It is a serious situation, they report, and it is up to the hunters to use reasonable methods in bagging the birds.

Many of the birds are concentrating in California this season because of a shortage of food in other former grounds. This situation makes it appear as though the birds are as plentiful as ever, naturalists declare, and to pursue a "blind" program of slaughter here will mean to create an added shortage of nesting birds in the north for the years to come.

When the duck ranks are greatly thinned the nongame birds in the north have a tendency to crowd onto the nesting fields, according to investigators, and the game birds are thus prevented from completing their brooding habits. Ducks, as a rule, always return to their native haunts to nest. It would thus seem that there is safety in numbers only in the nesting grounds.

Double-barreled guns also cause a lesser number of birds to be wounded and crippled. When a hunter has but two shots at his finger tips he generally waits his time and makes those shots certain. With five or six shells in a magazine the hunter will often take a couple of "good luck" shots at a passing flock and thus injure many birds that he does not get.

Many hunters have reported that they have cut their hunting expenses to a minimum my using a double-barreled gun. This saving was noted in the number of shells fired. When using a pump or an automatic the hunter wastes many shells simply because they are instantly at his command—he will often pump two shells into one duck when one was all that was necessary.

HOW TO WEATHERPROOF A TENT

If it is desired to make a mixture at home, the following will make your tent both wind and waterproof, but it must not be exposed to heat. On a bright sunny day set the tent perfectly taut, where the sun can reach it from as many angles as possible, after providing yourself with two gallons of turpentine and two pounds of paraffine, and a good stiff broad paint brush. Everything ready, place the turpentine in a pail or pot, add the paraffine, and set this in a boiler of hot water. When the paraffine is thoroughly melted, stir the mixture, remove from the hot water, and paint the tent quickly while the solution is still hot. It will be necessary to work rapidly, but care should be taken to distribute the mixture evenly. The sun will dry and set the mixture.—*Hunting and Fishing* January, 1931.

WATERPROOFING FISH LINES

Rubbing fish lines with a flannel cloth dipped in a mixture of two parts of boiled oil and one part of gold size is reported as a successful method of waterproofing. The solution may be prepared by shaking the two ingredients together in a bottle. The line should be exposed to the air and dried thoroughly before using.—American Game Protective Association news service.

HOME-MADE CAMP LIGHT

One of the biggest and most important problems connected with camp life is the lighting system. Anyone who has stubbed a favorite toe; tipped over the last can of milk; jabbed a dirty hand into the butter or blundered into a hundred other accidents while groping around "blind" can appreciate the value of having a good light.

Here is a description of a camp light that I have found to be very satisfactory. It is inexpensive, throws a dandy light and needs very little care:

First—Get a tin cup of good size with a handle.

Then—A flat lamp wick, $\frac{3}{4}$" in width.

Also—A 10-cent box of ordinary paro-wax.

And—A piece of small soft wire.

Now fold the lampwick lengthwise and sew it down the side, thereby making a long slender pencil-like tube. Cut this wick now into a length three-fourths inch longer than the cup is deep, and insert the wire in the wick to make it stand erect, bending the wire in such a way as to form a base for the wick to stand

on. Place this wick in the cup and fill the cup with melted parowax.

You now have an effective light that will light up a whole camp—will not spill or run down the sides like a candle. Wind can not blow it out and one filling will last for several nights' use as the wax has to burn and not waste itself.—Darrel B. Foss, Venice, November, 1930.

MOSQUITO DOPE

A formula which will give a firm, whitish, nonstaining cream of pleasant odor is made up of the following ingredients: Citronella oil (Burgoyne's), ½ ounce; cedar wood oil, ¼ ounce; spirits of camphor, ¼ ounce; and white petrolatum, 2 ounces. Melt the petrolatum or vaseline and then add the other items and place in a tin ointment jar. If you will place the jar on ice or in a basin of cold water and keep stirring until it thickens, it will make a fine mixture. Besides being an excellent repellent against insects common to camp fire, it is soothing and antiseptic to the skin. One application usually lasts a whole night. To avoid using it on the face, some persons employ the cream as a brilliantine for the hair, and it will thus keep mosquitos away about as well as if used on the skin.—Indian Journal of Medical Research, Calcutta.

ERADICATE STRAY CATS

Get rid of all stray cats. The semi-wild felines are taking a heavy toll in the feathered population this year and something should be done.

A most recent complaint came from San Joaquin county. Ranchers in the district complain that the cats are playing havoc with the quail down there this season. Other birds are also suffering heavy losses. One farmer reported that several stray cats are killing on an average of two yellow-hammers apiece per day.

Many requests are coming to the San Francisco office of the division to send wardens to the various districts for the purpose of destroying the cats. Wherever possible this is being done, but due to a limited personnel the division is not always able to comply with the requests; a variety of duties naturally limit the accomplishments of the men.

It is suggested that the ranchers and sportsmen themselves lend a ready hand in the solution of this problem. Semi-wild house cats are exceedingly wary animals and to hunt them down methodically would entail a great deal of expense, time and manpower. The farmer and sportsman stands an excellent chance of encountering these felines by reason of a constant life in the open.

By far the most successful method of fighting these pests is to catch them at their lairs. Because of a long association with man, a cat naturally seeks barns, sheds or other shelters near a habitation. Deserted farms are often found to be typical "dens" for stray cats; man is generally to blame for this condition in neglecting to take "Tom" or "Maria" along when he moves to a new home.

With the normal source of food removed these deserted cats quickly fall into their natural habits and depend on their hunting ability alone for sustenance. It is a well known fact that a cat favors bird meat above any other source of nourishment. Experiments show that a cat will even leave a pan full of food to go out into a thicket and hunt birds.

By all means never turn a cat loose in the weeds as a means of getting rid of the animal. Instead of ridding yourself of the problem you are merely pulling an avalanche of other troubles on your shoulders; not only your shoulders but on many innocent persons who are trying to protect the bird life of the state.

In issuing this message to the public the division does not wish to create the impression that it is an unreasonable enemy of the cat family. Cats make very good pets when properly held in check. They are also very useful animals in the problem of rodent control.

It is the stray cat that is causing a priceless amount of damage in this state. All deputies of the division have been requested to eliminate these wandering marauders when encountered in the hills and wild places; if ranchers, sportsmen and other bird fanciers will pursue a similiar course the problem stands an excellent chance of being well controlled. And the drawbacks accompanying the propagation of California quail will be greatly lessened.

CALIFORNIA AND FRANCE

That California fish and game work is being watched with interest by other countries of the world was brought to mind recently on receipt of the following letter from Louis Kuentz, professeur de langues, 89, Rue Des Martyrs, Paris, France:

"Dear Sir: I would consider it a great favor receiving from you the permission to use the material of the story entitled 'Tai and Carp' published in your California Fish and Game, Volume 16, July, 1930, Number 3.

"May I ask you to be so kind as to lend me, if possible, prints taken from

fig. 75 and 77, pages 235 and 236, or to tell me where to apply to get them, enabling me to give more attraction to an article which is to appear in one of our good magazines to which I am contributing for educational purposes.

"Of course full credit will be given to you for any material and picture.

"Apologizing for the trouble I am giving you and thanking you in anticipation,

"Yours very truly,

"(Signed) L. KUENTZ."

FEDERAL REFUGES

Statistics assembled by the Biological Survey of the Department of Agriculture covering the land status on the Bear River Migatory Bird Refuge in Utah, as of June 30, made public on September 20, show that the lands purchased total 15,860.65 acres; public lands withdrawn, 30,632.12 acres; state cession lands, 2,132.85 acres; lands leased, 7,860.98 acres, and right-of-way easement, 0.14 acre; or a total of 56,486.74 acres. When withdrawal lands exchanged, amounting to 4,099.8 acres, are deducted, the net refuge area is 52,386.94 acres. During the fiscal year 1930 there was expended for lands $24,547.28; other expenditures for acquisition purposes amounted to $307.41, making a total of $24,854.69. The average cost an acre for lands purchased was $1.55.

Of the 163,468 acres within the boundary of the Upper Mississippi River Wild Life and Fish Refuge, 19,162 acres are reported as agricultural and semiagricultural lands, 20,000 acres as unsuited for purchase, 9743 acres as state and city owned, 25,018 acres as public domain (made part of refuge by executive orders), 1,650 acres as acquired by gifts and cessions, 8777 acres under contract, and 56,548 acres actually paid for, leaving 22,570 acres to be taken under contract.

The cost of examining and appraising 225,000 acres was $22,500, or 10 cents an acre. This calculation is based on land area examined and takes no account of approximately 70,000 acres of interlocking waters that were covered by examinations. For making boundary surveys $10,939 has been expended, and $40,393.46 for negotiating for 65,325 acres under contract or acquired, or an average of 62 cents an acre. This figure is based on the tracts covered by contracts, although all the tracts within the refuge have been negotiated for. The average cost of lands taken under contract is $6.29 an acre, and the average cost of lands paid for is $6.06 an acre.

Lands to be acquired for the Cheyenne Bottoms Migratory Bird Refuge, near Great Bend, Kansas, the creation of which was authorized by act of Congress approved on June 12, are being surveyed by field crews of the biological survey. When the government gains control of the lands needed for the purpose, the refuge established will be of outstanding importance to the birds migrating in the Mississippi Valley region.

Topographic surveys of other proposed refuge areas are being conducted and engineering facts gathered with dispatch. Part of the information being obtained is to enable the biological survey to determine what may be done toward establishing migratory-bird refuges in regions where it may be possible to restore areas now desolate to their natural condition.

These refuges are being established in furtherance of the terms of the migratory bird conservation act, to preserve the birds of the United States and Canada protected by treaty with Great Britain.

RESERVE LAND NEAR DEATH VALLEY

An area of the public domain adjacent to Death Valley, in California, has been reserved from entry temporarily, pending consideration of the advisability of turning it into a national monument, according to the Department of the Interior.

This area is located within, or contains strategic points of unusual interest adjacent to the famous valley, and is considered of greater public value from a scenic and scientific standpoint than from that of economic development.

OPEN NEW SPORT LANDS

In accordance with H. R. 8368, passed by congress and signed by the President on May 15, there will be appointed a commission of three to cooperate with representatives of the Dominion of Canada to make plans for the construction of a highway to connect the northwestern part of the United States with British Columbia, Yukon Territory and Alaska.

Such a passage will undoubtedly have a tremendous influence over fish and game conditions in the northern territory and many sportsmen are of the opinion that strong measures should be taken to cope with this problem when it arrives. It is more than probable that many California hunters will desert the local territory each season to pursue their sport on "less congested soil."

HORSE DISEASE

Nearly 700 horses have been affected with a disease known as Borna disease, *Enzootic encephalomyelitis*, in the San Joaquin Valley during the past few months, according to the Department of

Agriculture. The disease is comparable to infantile paralysis among humans. Mortality has not been unusually high. The disease was recognized in the United States as early as 1847. Control measures are being studied by the Hooper Foundation of Medical Research and the Division of Veterinary Science, University of California.

ANIMAL DISEASES IN THE UNITED STATES

"The United States is entirely free from such serious diseases of animals as rinderpest, contagious pleuropneumonia, surra and foot and mouth disease," according to a statement made by Dr. John R. Mohler, chief of the U. S. Bureau of Animal Industry to the Inter-American Conference on Agriculture, Forestry and Animal Industry that met recently in Washington. Foot and mouth disease has been introduced occasionally, but prompt slaughter of affected animals and disinfection of premises has quickly eradicated it.

Dr. Mohler told delegates to the conference how a national quarantine law should be drawn up to prevent introduction into a country of serious animal diseases. For instance, federal officials should be able to control not only the animals offered for entry into the country but also the materials generally closely associated with live stock, such as hay, straw, forage, meats, hides and other animal products. Some of the most dangerous animal diseases may be introduced into the country through the medium of such materials and products.

Plans for an inter-American cooperative clearing-house for the exchange of information on animal diseases and control measures were discussed. Such a clearing-house would depend on the existence in each country of an efficient national live stock sanitary organization which could enforce suitable regulations for the control of animal diseases. Regular reports of the live stock disease situation should be sent by each country to the inter-American clearing-house for the benefit of all member countries. Unusual disease outbreaks, such as those of a nature not previously known, should be reported by telegraph.

EXPERT DIAGNOSIS

At a recent summer school of the American Fox Breeders' Association, Dr. S. F. Wadsworth emphasized strongly the need of having experts conduct post-mortems on foxes and other fur-bearing animals that die from unknown causes, instead of the ranchers trying to diagnose the cases. There are pathological changes that a trained man might see, whereas, to the novice the opportunity would be lost. Carcasses should be examined not more than twenty-four hours after death because in some diseases the organisms causing the fatality die and disappear. This holds true in all diseases connected with our wild life.

DECREASE IN HUNTING LICENSES

More than 6,425,000 hunting licenses for taking wild game were issued to sportsmen throughout the United States, including Alaska, in the season 1928–29. The revenue to the states amounted to more than $9,390,000. This sum includes receipts from combined hunting and fishing licenses but not from licenses issued for fishing only. Detailed figures for the season, compiled by the United States Biological Survey, show a slight decrease in the number of licenses issued and a small increase in the money receipts as compared with the preceding three years. In the 1925–26 season, 5,332,375 hunters paid for their licenses a total of $7,130,102, while in the 1926–27 season 5,989,795 hunting licenses were issued, bringing a revenue of $8,187,223 to the states. In 1927–28, 6,462,555 licenses were issued, and the fees paid were $9,338,173.

New York state, with 677,137 licenses and $703,047 in money returns, heads the list.

WILD DUCKS ON POTOMAC AFFECTED BY DISEASE

During the past several days a considerable number of dead wild ducks have been found on the Potomac River by officials of the Bureau of Biological Survey, U. S. Department of Agriculture, and also by individuals. These birds on being examined by pathologists of the department showed a severe inflammation of the intestinal tract caused by intestinal parasites. The biological survey, in announcing the result of the findings of the department, states that it is very improbable that birds in flight are clinically affected by the parasites. The survey points out, however, that the disease among the birds was discovered in this section only a few days ago and that investigations thus far are entirely in a preliminary stage. The specialists of the department are of the opinion that persons eating birds killed on the wing are very unlikely to suffer ill results, but advise that if any birds are killed on the water they be discarded if an abnormal reddening of the intestinal tract is evident.

COMMERCIAL FISHERY NOTES

N. B. Scofield, Editor

INCREASING SCARCITY OF CLAMS ON PISMO BEACH

The 1930 census of Pismo clams *(Tivela stultorum)* was made on Pismo Beach in the latter part of November by the California State Fisheries Laboratory. The results of this year's census are even more discouraging than in former years. The population is now so seriously depleted that any untoward circumstances make a dangerous inroad on the remaining numbers.

The winter of 1929–1930 was apparently unfavorable for the survival of young clams, for individuals of the 1929 year-class, constituting the largest set since 1919, appeared in the fall of 1930 in much fewer numbers than had been anticipated. That this was the result of naturally unfavorable conditions and not due to man's activities was indicated by the fact that the rate of mortality for the 1929 year-class was 59 per cent on the beach open to digging and 60 per cent in the area closed to diggings. This heavy loss of individuals of the previous year's set was somewhat counterbalanced by a good set in the summer of 1930. While not as numerous as in 1929, the clams resulting from the 1930 season's spawning comprised the second best set since 1919.

On the other hand, clams older than the 1929 group were exceedingly scarce on the beach, especially in the open area. No legal sized clams were found in this section of the beach and only 2 per cent in the closed portion. In the open area the number of clams older than the 1929 year-class decreased 81 per cent between 1929 and 1930, while in the closed area these clams decreased only 20 per cent. That the high rate of mortality for the older clams was caused by the clam diggers taking illegal sized clams is apparent, for if this great decrease in numbers had been due to natural causes the same death rate should have prevailed in the closed area as in the open district. In the present state of depletion, the taking of small numbers of illegal clams has a very serious effect on the remaining population. Most of this poaching is presumably done by amateur diggers who do not realize the grave consequences of their offense.

It is evident that present protective measures will not increase nor even maintain the numbers of clams on Pismo Beach. The closed area will save the species from extinction, but to bring the Pismo clams back to commercial importance the entire beach should be closed to all digging for a number of years.—Frances N. Clark, California State Fisheries Laboratory, November 28, 1930.

CHANGES IN MONTEREY SARDINE FISHERY DESCRIBED

During the fishing season of 1929–1930, Monterey's sardine industry reached one of the dividing points in its development. The months between August of 1929 and February of 1930, so far as fishing methods at Monterey are concerned, saw the virtual disappearance of the familiar lampara net, its substitution by the ring net, the introduction of the purse seine and the purse seine boat, and the extension of the Monterey fishing area considerably farther to the north. In one season methods that had been in steady use for 24 years underwent a more or less complete change.

This revolutionary departure forms the subject of Fish Bulletin 23, recently published, and written by J. B. Phillips of the State Fisheries Laboratory under the title, "Success of the Purse Seine Boat in the Sardine Fishery at Monterey, California."

By photographs, graphs and text, Phillips gives a brief history of changes in gear in the Monterey sardine fishery from 1903, describes the new equipment installed in 1929–1930, explains its use and presents data showing its effect on the industry.

For the purse seine boat this effect is found in greater cruising radius, marked extension of the Monterey fishing area and larger and more dependable catches. Where only two purse seiners fished at Monterey in the 1928–1929 season, as many as 28 operated by December, 1930.

The smaller lampara boats, almost without exception, meanwhile altered their gear by installing drum winches and ring nets, the latter similar in principle to the purse seine. Speed and certainty of operation are factors favoring the ring net over the lampara.

While the big purse seine boats formed only one-third of the craft in the Monterey sardine fleet of 1929–30, they delivered 40 per cent of the catch received by the canneries.

Twenty per cent of the 1929–1930 catch was taken in the area north of Pigeon Point, an area largely exploited by the purse seiners. Phillips finds that the northern section of the Monterey fish-

ing area is showing a higher relative gain in sardine tonnages than the southern section nearer Monterey.

Both to the layman and the man engaged in the sardine industry Philips' report contains interesting and valuable material. Copies of this publication may be had by writing to the California State Fisheries Laboratory, Terminal Island.

LIVE BOXES FOR ABALONES AT MONTEREY

About October 1, 1930, abalone crews at Monterey started to use crates in which to keep abalones fresh for market delivery. These crates are constructed of wood, and most of them are approximately six feet square and two feet deep. They will hold between 20 and 30 dozens of market-size abalones. The crates are kept in the waters where the crews are allowed to take abalones commercially by diving. The live boxes will aid the crews in conforming to the law, which specifies that abalones must be brought in alive and in the shell. It will also enable the crews to go farther away from the home port and tap new grounds. As soon as a crate is filled with these mollusks, it is lowered in the water with a rope bearing a signal float at one end. The part of the load caught first is thus kept fresh until the boat has attained its capacity or is ready to return to port.—J. B. Phillips, California State Fisheries Laboratory, November, 1930.

ALBACORE AT MONTEREY

Monterey experienced a short run of albacore (*Germo alalunga*) during the fall of 1930. About 86 tons of the white meat variety of tuna were delivered to the Monterey markets, of which practically the entire catch went to the San Pedro canneries. The albacore deliveries started on September 22 and ended about October 20. Although practically the entire Monterey deliveries were made by jig boats, there were several live bait boats fishing in the Monterey area which came from San Pedro. How much these boats took directly back to San Pedro with them is unknown as no figures are available in Monterey. The top price was 8 cents per pound. For a time the price dropped to 5 cents, but fishing ceased at this price.

The albacore were reported as having been caught about 15 miles southwest of Point Pinos. The boats bringing in this species at Monterey are the usual jig type of boats used for catching mackerel, rock cod, salmon and the less abundant varieties of commercial fishes. These jig boats are 20 to 30 feet long and have six and eight horsepower engines. Artificial lures were used entirely in catching the albacore. Six hundred pounds were considered as a very good load for one of these boats.

C. B. Andrews reported (California Fish and Game, Vol. 13, No. 2, pp. 141–142, 1927) the last appearance of albacore near Monterey during the fall of 1926 in quantities to warrant interest. About 60 tons taken from off Point Sur were delivered in Monterey. He also reported the appearance of this fish in the fall of 1925 from notes of W. A. Selle. This was the biggest year for albacore at Monterey, some 194 tons being landed Delving into the back files of albacore statistics for Monterey, it is found that albacore have been landed at Monterey every year since 1922 with the exception of 1929, although in some years only a few hundred pounds were landed. The catching of albacore in the Monterey vicinity seems to be concentrated in the fall months, usually from September to December. The following table shows pounds of albacore landed at Monterey and Santa Cruz since 1920 (statistics from California Fish and Game):

Year	Monterey	Santa Cruz
1920	----	----
1921	----	----
1922	236	----
1923	149	----
1924	420	----
1925	387,729	51,575
1926	118,563	120
1927	1,051	----
1928	180	----
1929	----	----
1930	172,616	346

Albacore have been reported this year as far north as Yaquina Bay in Oregon. The "Pacific Fisherman" first reported large schools close to Yaquina Bay during the latter part of August. Several large specimens were taken incidental to salmon trolling. According to halibut fishermen out of Newport, Oregon, several large schools of albacore were reported 30 miles off-shore a year ago. Ordinarily, the northernmost range of the albacore on our coast is San Francisco. Shifting of warm ocean currents may have much to do with the appearance of the albacore so far north.—J. B. Phillips, California State Fisheries Laboratory, November, 1930.

ANOTHER WOLF FISH TAKEN AT MONTEREY

A wolf fish (*Alepisaurus aesculapius*) was taken in the surf at Monterey on October 12, 1930. The last one recorded as being taken in the Monterey vicinity was on April 5, 1930 (California Fish

AND GAME, Vol. 16, p. 267). Previous to that time, no wolf fish had been reported from the Monterey region since July 18, 1925 (CALIFORNIA FISH AND GAME, Vol. 11, p. 188). In the August 15, 1930, number of the Service Bulletin (issued by the Division of Fish and Game for its employees), Captain Lippincott of Eureka reported the capture of a wolf fish in Humboldt Bay. The last record of this fish from the Eureka vicinity was in 1892. In spite of the three reports during 1930, the taking of a wolf fish from California waters remains an interesting event.

The natural habitat of this species is at considerable depths in the ocean. Once this creature is forced too far above its natural strata, its capture is rather easy due to the rupturing of muscular, fibrous and bony structures by the much lessened pressure at or near the surface. The outstanding features of this odd fish are its lance-like body, its large pointed head, the long wolf-like teeth set in huge strong jaws, the comparatively large eyes, the high and long sail-like dorsal fin, the long pectoral fins just behind the head, the large deeply forked tail, and the flange-like epidermal keel along either side of the body.—J. B. Phillips, California State Fisheries Laboratory, November 26, 1930.

LIFE HISTORY NOTES

REMINISCENCES OF A HUNTER AND COLLECTOR

Chase Littlejohn, professional hunter, collector and close observer of animal life in its native haunts, gave reminiscences from his rich store of field experiences on September 4, 1930, before the Section on Scientific Research of the Commonwealth Club of California. His remarks are reproduced in part from notes taken at the meeting.

In the early days waders were so abundant in the tide flats and waters of San Francisco Bay that a stone thrown among them would result in many casualties. When a boy, I sometimes remember going out with a pocketful of stones and killing any number. They were so thick that it was possible to hit them without much skill. Around the present vicinity of Redwood City, I can recall seeing thousands to each flock whirling clear out into the bay. As they pursued their zig-zag course, their dark inconspicuous backs would blend with the landscape. Then in a few seconds they would turn in unison as if in some way mechanically connected, flashing their white undersurfaces and making a grand show of their numbers appearing and disappearing.

I knew a couple of hunters, who after the duck season was over, used to shoot snipe for the San Francisco market. They would skull up immense flocks when the tide was up and the birds were probing for food in the higher flats. With a double shot they would sometimes kill enough to fill two gunny sacks. One shot a No. 4 gauge, the other a No. 6 gauge gun. Almost always they could fill two sacks with two shots apiece. You can well imagine the number of waders we had in those days!

The ducks were almost as plentiful. We had more ducks in San Mateo County up to the time I was 10 years old than we have in this whole state at present. This seems like an exaggerated statement, but you could go any time during the winter months, look up and down the sloughs or over the marshes and see masses of ducks rafted everywhere.

When only a little fellow, barely able to handle a gun, I went out with my brother. We turned a bend and ahead was an immense flock of teal duck. Something frightened them, but they flew out only a little way and then began to swim back. My brother made one shot with his big gun. The numbers of birds rising up so surprised him that he failed to fire the second barrel. I picked up 75 ducks. It is hard to believe that so many teal could be killed with one shot.

After pump guns came in and more people went hunting, ducks gradually became scarcer and scarcer. At the present time what a change is found! I think within the next five years quite a few of our ducks will be extinct or practically so reduced as to be of no utility or benefit to hunters.

I have been trying to get a collection of ducks known north of the Panama Canal. I have written dozens of letters addressed to persons from the Atlantic coast to the Philippine Islands. I hope to show people what we had in the days that are gone, and how rapidly we are destroying what remains by not giving them proper protection. So far I have been unable to secure certain ducks that were very common a few years ago.

In 1927, I took care of the Cardinal Gun Club above Colusa. I did so especially to get specimens. Everything was done to attract the ducks, ponds were baited and made alluring. Only some thirty-six ducks were bagged by the whole crowd. The Eureka Gun Club, a two-mile preserve across the highway, had fair shooting. It is now deserted. The best club in the locality was a natural lake. Even this is now deserted. One club above the Marysville Buttes had an enviable reputation for the fine mallard shooting which its members enjoyed. Only one pair was killed last year.

One of the finest breeding grounds we had in the state was in lands formerly owned by Miller and Lux near Los Banos. Gun clubs now occupy the best places in the area. Shortly after the opening of the season, hunters killed all the young birds born and bred in the locality. You can travel for hours and not see a duck. The red head is the only one that is holding its own. Three or four years ago, it was no trick at all for me to find forty or fifty ducks' nests in a few hours' walk. Recently, five of us found but twenty ducks' nests, three were occupied, the balance deserted. The section will soon be depleted and no birds left, because the breeding stock as well as the natural increase is being harvested to the limit. As long as there are ducks to shoot, hunters will shoot them. When they are all gone they will complain because they cannot kill any more.

Our rails are struggling to overcome so many handicaps, it is a wonder any are able to succeed. Closed seasons since 1880 and complete protection since 1915 have failed to give them a new lease on life. Their numbers have been continually restricted by the encroachment of civilization in their homes and the destruction of their feeding grounds. To make matters worse their enemies are on the increase. Red-tailed hawks have taken to a changed diet since the ground squirrels have been nearly wiped out. They fly over the marshes circling until a rail is spied in its cover or where it can be captured by an opportune swoop. I killed four red-tailed hawks crossing my place near Redwood City carrying rails they had just caught off to the hills where they roosted during the night.

Another enemy is the mussel. Accidentally introduced with a shipment of oysters, the plaited horse-mussel has become very abundant in the San Francisco Bay area. I well remember the first horse-mussel I ever saw. At first I thought I had discovered a shell new to conchology. A few years later I found clusters of the new mussel in many places. It seemed but a short time after this when every little gutter place affording anchorage contained them. Now the banks of the small muddy sloughs which penetrate the salt marshes in every direction are fairly paved with them like cobbles in a street.

It is the habit of the rail to skulk along the edge of the water probing here and there for worms and insects. If the mussels are feeding and sending out tiny fan-like lips to capture prey, the rail, mistaking the lips for worms, drives its bill into the shell. The mussel closes and the rail's fate is sealed. The mussel never lets go and when it dies, it is tighter than ever. I secured a rail not long ago with its bill nearly crushed in two by a mussel clamped on it. The bird was nothing but skin and bone and had starved to death.

It has been my experience in collecting rails for scientific purposes to find only one out of ten rails with all its toes. In many cases, one to three of the toes will be gone. Occasionally, the whole four are missing and big balls a quarter of an inch in diameter have taken their place. I have caught specimens alive dragging a mussel fastened to a toe. Apparently the bird would carry this impediment until the toe broke off.

Several years ago I took a friend out in the marsh to show him the way the rail nested. We found a number of nests that had little downy young. We heard a cheeping as if a bird was in distress. We found the nest and the old bird rushed off into the tules, the little fellows following after her. All but one, for this fledgling had a mussel on his foot almost as big as he was. The tide was coming in and in ten or fifteen minutes he would be drowned.

There has been some uncertainty in the minds of zoologists whether grizzly bears ever existed in San Mateo County. It is believed that the county was inhabited only by black bears. In my boyhood grizzlies were common around Woodside. The vaqueros took pleasure in lassoing them and bringing them to town alive. After they had tired of the sport of displaying their dangerous playmates, they would slaughter them and ship the carcass and hide by boat to San Francisco. I was about six years old when the last grizzly was brought in. I managed to cut off one of the claws before the animal was shipped away. I have treasured the trophy all these years.

I also have the skull of a grizzly found by some working men several years ago while grubbing out a deep canyon for some milling operations. Apparently, this animal had been shot and had sought the canyon's depths to die. The skull is evidently that of a very large old bear.

During my boyhood mountain lions were present in goodly numbers. It was a common sight to see a lion being brought in strapped to a horse. Lion skins were also common.—Rodney S. Ellsworth, 510 Russ Building, San Francisco, California. October 15, 1930.

CONDORS ON THE SANTA BARBARA NATIONAL FOREST

We were standing on the porch of the lookout tower on Frasier Mountain in the Santa Barbara National Forest. A large bird was soaring some distance away.

"Is it a condor?" said the lookout. The glasses showed two snow white triangular patches under the wings. The wings angled upward with a beautiful upcurving of feathers at the ends. It was a condor!

We were doing some map work covering the Santa Ynez and San Rafael ranges and often saw these great birds—always soaring. Since they are seldom seen very near by I think they are frequently mistaken for turkey buzzards or eagles. We met comparatively few people in the region who knew them.

Only twice during the summer were we close to one. Each time, the bird was about to alight and both parties were considerably startled. The condor reared back frantically with pumping wings but immediately regained perfect composure

—apparently pretending not to have been at all surprised and sailed away without further wing movement.

One individual that I saw trailed his feet as though he were tired holding them up.

Where Sespe Creek cuts across the Topa Topa mountains between ample cliffs, it was my good fortune to see three condors flying in a group. No wilder scene is hardly conceivable than that of these dark, giant forms gracefully weaving about among the great rocks.—R. St. John, United States Forest Service, Berkeley, California.

BLACK-CROWNED NIGHT HERON IN CALIFORNIA

Twenty-four years ago a pair of black-crowned night herons *(Myticorax nycticoras naevius)* was observed to be using a large spreading laurel tree for a roosting place among Alhambra Creek in the city of Martinez, Contra Costa County. The tree is situated along the line of Henrietta Street.

At that time this section of the city was very sparsely settled and with the exception of a few houses and a school near the creek banks, there were no other encroachments of civilization. Plenty of rough fish and turtles thrived in the deep pools along the stream and in the winter time the surrounding fields were generally flooded with water.

The writer, then in his early teens, often observed these water fowls feeding at dusk on the frogs and whatnots in the fields, and many an unsuccessful attempt was made to shoot one with a slingshot. It might also be well to add that under this tree was a favorite spot for settling school-yard fist battles—the main gallery consisted of perching places along the limbs and in the crotches of the laurel. A vivid recollection recalls that gangs of us scallywags made numerous and stony raids on the peace and quiet of this pair of herons.

But times have changed a great deal since then. The district has been settled until it is now practically in the center of the city. Noisy groups of children from the nearby primary school play steadily near the tree throughout the year. At times, members of the street department have trimmed the limbs of the laurel for a considerable height. The pools in the creek have been filled and cluttered with refuse. Not only that, but a small family lived in a temporary cabin under the tree for a number of years.

Recently, the writer observed that a pair of black-crowned night herons still used the tree for a roosting place.

Whether it is the original pair or not is a matter for speculation. No more than three or four of these birds have been seen at a time in the district.

Often at night the familiar *q-u-a-r-k*, the call of these mysterious night feeders, can be heard and they can be seen soaring laboriously over the rooftops before they pass quickly into the dark like lost raiders. It is known that they feed in the marshes that are numerous in this section of the Suisun Bay territory.

I have been unable to find any heron nests in or near the laurel tree.—Earl Soto, December 14, 1930.

SPINY-RAYED FISH, SAN DIEGO COUNTY LAKES

The records of the California Fish and Game Commission will show that a shipment of large-mouth black bass was first planted in Cuyamaca Lake in 1888, by a Mr. Richardson, Superintendent of the Sisson Hatchery, and Mr. W. Lawrence of the Spring Valley lakes of San Andreas. Mr. Lawrence was superintendent of the lakes at that time. Since this first introduction of black bass into Cuyamaca Lake, there has been from time to time other plantings made from this first original plant to other San Diego County lakes with the result that this county now boasts of being or having the best bass fishing in California, if not in the United States. These fish have been introduced into the following lakes: Sweetwater, Moreno, Hodges Upper and Lower Otay, Murray, Grossmont, Lindo, Henshaw, and Wolford lakes, resulting in thousands of anglers visiting these lakes and tons of these fish are caught, affording pleasure and recreation. These lakes are under State sanitary control with sanitary rules enforced. Climatic and water conditions are ideal, with an abundance of fish food as crustaceans, scuds, snails, dragon and may-flies, shinners, small sunfish, chara and many other aquatic plants. Under these conditions these fish attain an exceedingly rapid growth, the fish averaging from 1 to 8 pounds.

Some years ago small-mouth bass were introduced into Escondido Lake, now called Lake Wolford, and had rather a sad ending. The water being low and used for domestic use, it was decided to give this lake a treatment of bluestone or coppersulphate. The parties undertaking this operation, not being familiar with its strength, either gave the lake an over-dose or allowed a barrel to slip and fall into the lake, with the result that all fish life was destroyed. In 1925, this lake was stocked with large-mouth bass and has afforded some wonderful

fishing. The fish having attained a growth from two inches to six and one-half pounds in weight.

At the termination of the San Diego Exposition, The United States Bureau of Fisheries donated a number of species of fish to Deputy Fish and Game Commissioner, Webb Toms. January 6, 1917, Deputy Toms transported sixteen crappie to a small pond at the head of Moreno Lake. Due to the road conditions it was impossible to reach the lake at this time. From this original planting the above mentioned lakes have been stocked. These fish like the bass, have multiplied beyond expectations, with the result that thousands are now caught. These fish afford excellent sport for the fishermen and average in weight from ½ to 3 pounds. They make an excellent pan fish.

Sunfish or bluegill are exceptionally abundant in these southern waters. An old saying was that if one did not drain the bath tub at night, you could have sunfish for breakfast in the morning. Although I shall have to admit this was somewhat exaggerated nevertheless they do afford a great deal of sport for the women and children, being a valuable food and pan fish.

Due to the vast increase of anglers in this country during the past few years, it seems impossible that the lakes can continue to furnish these game fish unless better protection is afforded. Namely, to place these lakes under State Control as to seasons on bass. At present they are governed by municipal or private control. District 4¾, which comprises Imperial and San Diego Counties, does not include a closed season on bass; nevertheless, due to the other species of fish which are protected by State Laws regarding the seasons in which they may be caught, these lakes are not open to the public at all times and only at times when other protected fish may be taken. Special privilege is sometimes granted, with the consequence that other fishermen see these men fishing and a hue and cry arises. By placing the bass under State control, it would eliminate this feeling. Due to climatic conditions, the spawning season of 1928-29 and 30 was late, with the result that thousands of spawning fish were caught. As these fish carry from 2000 to 10,000 eggs at spawning time, one can readily see the depletion which will follow under the present conditions. In view of these facts, I should like to recommend a later opening season; also an earlier closed season to protect these fish from extermination in a few years. The present State limit of fifteen bass, with none under the nine inch limit, providing a shorter season is made, will meet with the approval of the majority of the sportsmen. Otherwise a creel reduction should be made. I would recommend the present limit of twenty-five crappies be reduced to fifteen, with the present limit of twenty-five sunfish to remain unchanged.—Ed. Glidden, San Diego, California.

CONSERVATION IN OTHER STATES

ONE-DAY HUNTING SEASON

A one-day hunting season on pheasants and quail was held November 1 in Douglas County, Nevada, according to a report submitted by J. W. Thornburg, warden at Markleeville, California. It is the first open season, in this county, for these birds in ten years, the report reads.

The pheasant were first liberated in the Carson valley ten years ago by a few farmers and sportsmen in the county. The birds have been liberated in small numbers each year. The first golden pheasants were liberated two years ago.

TURKEYS PLENTIFUL IN MARYLAND

It is interesting to note in the fall issue of the *Maryland Conservationist* that more than 400 wild turkeys were taken in Allegany County during the hunting season of 1929 and that the birds are increasing rapidly in that state. In a report to the State Game Department, Harry R. Kenney, district deputy game warden of Allegany County, said that it was his belief that sportsmen would be favored with one of the greatest hunting seasons for wild turkeys that they have had in years past.

Investigations show that California possesses quite an area of turkey country which is being developed under the general supervision of August Bade, superintendent of the state game farm at Yountville. More than 300 turkeys have been liberated during the past season and these birds are showing great promise of becoming established in our wilds, according to reports of field men.

TO PREVENT WASTE OF GAME

In an endeavor to stop game waste, the state of Washington recently added to its game laws a statute making it a punishable offense for a hunter to fail to properly dress, care for and utilize his kill within 24 hours. The law calls for a fine of not less than $250 nor more than $1,000.—American Game Protective Association news service.

RAISE WILD DUCKS

Large scale propagation of wild ducks is being carried out in North Carolina for the first time by Joseph P. Knapp, of Mackey's Island, Currituck County game enthusiast, according to a monthly bulletin from that state. Reports show that the enterprise has been surprisingly successful and facilities will be greatly expanded next season. The hatch of birds, mallards, was 55 per cent of the eggs set or a total of 3556. Only 84 birds were lost. A total of 2000 ducks had been liberated on the island before the end of July and reports show that the birds soon reverted to the wild state. All birds are banded for study purposes.

GAME FARMS PROGRESS IN WISCONSIN

Reports from all sections of the country reveal that the game farm is playing an exceedingly important part in game conservation work. In a most recent bulletin from Wisconsin the following was noted: "Production statistics recently compiled by the conservation commission indicate that 1930 is a most successful year at the state game farm. Nearly 40,000 pheasant eggs were produced this season at the farm which is located in Peninsula State Park in Door County. The pheasant egg fertility this year was 96.56%. In addition to the work with ringneck pheasants, experimental work is being carried on at the game farm with several other species, principally Hungarian partridge, wild American turkeys, sharptail grouse and quail. Besides the birds there are ten deer held in a large field at the game farm and a study is being made of their feed and habits. Similiar studies are being carried on with raccoon, bear, mink, porcupines, coyotes, wolves, badgers, and several species of hawks and owls."

August Bade, superintendent of our California farm at Yountville, also reports that the past year has brought great success.

PLANT FINGERLING BASS IN FLORIDA

Arrangements have been made with the United States Bureau of Fisheries to secure 400 fingerling small-mouth bass from the Federal hatchery to Louisville, Kentucky. These will be sent by special messenger to Tallahassee shortly after the first of November.

Included in the shipment also will be 500 fingerling rock bass.

These fish will be placed in the Wakulla River, Suwannee River, Chipola River and the Wacissa River in Jefferson County. These streams were chosen on account of the fact that the temperature of the water in these streams, and other characteristics, will be more suitable for these species of fish than the water in the southern part of the state.

PROTECTING WILD LIFE OF MAINE

Maine has approximately 439,000 acres of territory devoted to game preserves and wild life sanctuaries, and additions are being made from time to time. These preserves are scattered about the state, on the coast, on islands, in private and semi-public parks and in the big woods. They vary greatly in size from tracts of a few acres to areas containing several townships.

Conservationists agree that the game preserve is the biggest step that can be taken in bringing wild life back to normal, and so it is proving in Maine. When one of our preserves, of about 45,000 acres, was established four years ago, it was practically impossible to find a deer in it. The region is only an easy day's drive from the central part of the state and the game had been destroyed. At the present time, however, it is possible to see game of all kinds during a drive around the borders of the preserve.

The first game preserves in this state were established in 1917, by special acts of the Legislature. Others have been established at succeeding sessions until now there are 38 reserved areas. Bills asking for the designation of certain tracts as game preserves have been very easy to get through, and as a result no definite requirements have ever been set up, until 1929, when an act was passed giving the Commissioner of Inland Fisheries and Game and the Forest Commissioner joint authority to establish game preserves for ten-year periods in the six counties of the state which contain large areas of wild lands.

Two such tracts have already been set aside, one of 89,434 acres in Aroostook County and one of 45,000 acres in Somerset County. In choosing these preserves great care was taken to select regions which are natural breedings grounds for game and are plentifully supplied with food and water coverts.

All game preserves are marked with large metal signs in black and yellow, and are given special patrol attention by the game wardens. Signs are placed at all roads entering the preserves and at points in clearings and open spaces where they may be easily seen. Hunting and trapping are forbidden and firearms must not be carried in the reserved territory.

No distinction is made legally between the seacoast preserves and the forest ones, but in practice the coast preserves become refuges for ducks and other waterfowl. If beaver, otter or other animals pass within the limits of the preserve, however, they are afforded full protection.

WARDENS CARRY BINOCULARS

It seems that down in Alabama the fish and game law violators have been in the habit of carrying field glasses and thus making a get away long before a warden had a chance to get within arresting distance. But now all wardens of the State Department of Game and Fisheries are carrying light but powerful binoculars.

HUNT DEER WITH SHOTGUNS

Deer hunters in New Jersey will fare forth without rifles in their quest for game this year. The state law which prohibits the use of rifles in deer hunting has not been repealed and, as a result, the hunters will resort to shotguns.

It is reported that thousands of deer are wounded by buckshot each season in New Jersey and wander into the swamps to die an untimely and painful death. Sportsmen of the state, it is alleged, are desirous of having this law repealed or amended.

Deer season in New Jersey will extend from December 17 to 21.—*Sports Afield and Trails of the Northwoods*, December, 1930.

PHEASANTS IN SOUTH DAKOTA

The best pheasant hunting in the United States is said to be found in South Dakota. It is estimated that 2,000,000 ringnecks were killed in that state during 1929, and that a plentiful supply was left for seed. The season lasted 90 days with a daily bag limit of seven birds.—American Game Protective Association news service.

SHORTAGE OF PHEASANTS IN MISSOURI

The Missouri game commisison reports a shortage of pheasants among commercial breeders the past spring, due to increased demand by state game farms and sportsmen's associations.

This fact should be an encouragement to those who are beginning in the business of breeding pheasants as a business undertaking. The demand for pheasants for breeding and stocking purposes is constantly growing.

Missouri has operated its game farm since 1928, but for the first two years it was merely a refuge. Birds have been encouraged to nest under natural instead of artificial conditions.

INCREASE OF SWAN

Although swans are said to be very slow breeders, since given protection the whistling swan family have increased along the Atlantic coast from less than 1000 in 1916 to approximately

28,000, according to an estimate of Jack Miner, bird authority of Kingsville, Ontario.

This increase is said to have resulted from the strict protection given the birds following the signing of the migratory bird treaty with Canada.

By enticing the swan to the western end of Lake Erie during the migration period, Miner has saved the lives of hundreds of swan which would otherwise have been swept over Niagara Falls. The annual destruction of swan at Niagara has been large in years past.—American Game Protective Association news service.

BEAVERS IN FLORIDA AND CALIFORNIA

The pair of beaver from Pennsylvania which were released in Jefferson County early last spring have raised three young. The beavers were released near Monticello and their activities were noted in this vicinity for a short time. All trace of them was lost for several months. Recently, they were discovered with their addition to their family some ten or twelve miles from the place in which they were released.

The beaver was formerly a native of Florida but the supply was exterminated several years ago.

Because of the advanced irrigation development in this state the beaver is generally considered a detriment. Years ago these rodents were quite numerous in the river districts. It is said that they even existed around the San Francisco bay. The only protection afforded the animals now in California is in the remote districts where little or no damage can be done by stream obstructing activities. It is also said that Florida is not faced with irrigation problems such as ours. They are rarely found in our river territory now.

BEAVER GOES TO PRISON

Inmates of the Colorado State Prison were recently startled by the discovery of a new recruit in the form of a 58-pound beaver, which had taken up his abode just inside the prison walls.

Gamewarden W. W. Ireland was called into consultation and captured the beaver, although only after taking a considerable beating and being bitten by the animal.—*Pacific Sportsman*, December, 1930.

HUNGARIAN PARTRIDGES IN OKLAHOMA

Sometime during December 100 pair of Hungarian partridges were released in the center of the Harper County Game Farm. These birds were shipped in from Ulm-Donau, Germany, and of course, since this is their initial experiment on this particular specie of game bird, they have high hopes for big returns from the investment.

It is felt that since the Hungarian partridge is so similar to the native birds of Oklahoma that it will easily adapt itself to climatic conditions. It is much like the bob white, being a little larger, but smaller than the prairie chicken.

A consignment of 600 hungarian partridges, from Czechoslovakia, were received on November 22 by August Bade, superintendent of the California state game farm at Yountville. The birds stood the long trip very well. After a rest period, during which they will be thoroughly examined for health conditions, the birds will be liberated in suitable territory. It will be the third planting of partridges in the past few years.

"RED CARP"

Goldfish, thought to be the descendants of fish that escaped from Belle Isles in a flood 17 years ago, are caught in commercial quantities and food sizes in the Great Lakes, according to a statement by the Michigan Department of Conservation.

These fish were first apparent in quantity in the Sandusky Bay region in 1920. The fish are now taken in large numbers by commercial fishermen who haul seines in Lake Erie.

The larger specimens are sold for food on the market and are known as "red carp." Others are sold alive for stocking private garden pools.

These fish are much larger than the fish ordinarily seen, generally attained weight of from one to two pounds, as compared with goldfish confined in bowls or small aquaria which seldom attain any considerable growth.—Washington, D. C., *United States Daily*.

DIVISION ACTIVITIES

Bureau of Patrol

Fred Herman, volunteer deputy, was appointed to special duty on the Shasta River in connection with salmon experiments being conducted by Dr. Snyder of Stanford University.

During the month of September a total of 295 arrests were made and 345 fines were imposed for a sum of $11,755. For a like month in 1929 a total of 276 arrests were made which brought a sum of $9,382.

In October the deputies made 266 arrests which brought 213 fines for a total sum of $7,840. During the same period in 1929 the deputies made 251 arrests and brought fines aggregating $8,420.

Five arrests were made in 1929 in October for using illegal nets in San Luis Bay. These men were fined $125 each. The case was appealed to a higher court, which affirmed the Division. The fine of $625 was paid in October this year.

During November the deputies made 237 arrests, 195 fines and the state collected $6,290. During the month of November, 1929, 253 arrests were made with fines totaling $8,332.

Bureau of Commereial Fisheries

All the sardine plants at Monterey operated during the month of September exeept the Bayside Fish and Flour Company, which closed as per agreement, and the Monterey Sardine Products Company.

The quality of the sardines taken was a little better than during August, but most of the catches made within Monterey Bay were soft on account of "green feed." The fish continued to carry a high percentage of oil.

The State Board of Health had an inspector at each plant and were very strict in passing on the quality of the fish. In regard to the "green feed," the State Board of Health did not condemn the fish but required that the fish be thoroughly cleaned.

There was trouble over the price of the fish, and on September 23rd the fishermen went on strike and were out until September 30th. The strike included fishermen at San Francisco.

In spite of these drawbacks, there were taken at Monterey and Pittsburg during September 21,620 tons of sardines—this is an increase of 1777 tons more than were taken for a corresponding period last year.

There were packed in the same districts 243,552 cases of sardines which is an increase of 7710 cases over the same period last year.

There was produced during September 623,051 gallons of sardine oil, an increase of 158,936 gallons over the same month last year. They averaged 42.7 gallons for each wet ton of material used in the reduction plants.

During the month the commission issued General Order No. 11 for the regulation of sardine canners, reduction plants and packers of other sardine products. This order consisted of four regulations, the first three to facilitate checking the receipt of fish and amount of pack at the different plants. Regulation No. 4 was made at the request of the State Board of Health, and provides that only sardines which are fit for human consumption can be received at canning or reduction plants. This order was served on all sardine plants and fishermen's organizations at Monterey, Pittsburg and San Francisco on about September 23d.

On September 6th, the salmon season on the Klamath River closed and the eommercial cateh of salmon was abont double that of 1929. The cannery packed 10,342 cases of salmon as against 5253 cases last year. It is believed that this increase was due mainly to the small amount of sea trolling carried on during the summer.

The season on the Sacramento River closed on September 17th and it was reported there was a phenomenal run of salmon on the river.

Two salmon trolling boats, going from Eureka to Monterey, caught about 600 pounds of albacore, which were delivered at Monterey on September 22. Two of the fishermen from Monterey caught about 500 pounds of albacore about ten miles outside of the bay. This created created a great deal of excitement and

all of the local salmon boats, and some of the lampara boats, started out to troll for albacore—as high as eight tons per day were caught, and a bait boat was sent up from San Pedro to buy and transport these fish to the canneries at that port.

Three lampara boats at Monterey brought in 20 tons of horse-mackerel each during September.

On September 15th, Capt. H. B. Nidever was transferred to Monterey to take charge of the patrol boat "Albacore." He was transferred later in the month to the San Francisco district, where he has taken charge of an intensive campaign to straighten out the boat registrations and the fish receipts in northern California, in order to get them in shape for installing a punch card system for handling the fisheries statistics.

Captain S. H. Lyon, of the game patrol department in charge of the Sacramento district, was detailed to Terminal Island in September to take charge of the Commercial Fisheries Patrol and inspection of canneries.

Sardines were fairly abundant in October but there continued to be trouble with the "green feed" in the fish caught within Monterey Bay. Purse seine boats which operated outside the bay brought in better fish.

The amount of sardines received at Monterey and Pittsburg for October was 33,830 tons, as compared with 35,401 tons for the same period the previous year.

During October the "Bluefin" was kept busy on patrol, mostly near the lobster grounds previous to the opening of the season. Many baited traps were found and destroyed. On October 8, it overhauled a boat owned and operated by two Santa Barbara fishermen, on board of which was found 1200 pounds of spiny lobsters; as the season for possession of lobsters would not open for another week, the men were arrested and pleaded guilty before the justice. Each was fined $300.



FIG. 37. Salmon weighing 59 pounds caught in the San Joaquin River in shad nets near Pittsburg, California. Photo by E. S. Cheney, April, 1929.

During October there was a rush of salmon at the Shasta counting rack. The water was for a time too muddy to count the fish through sight so workers resorted to dipping the fish and placing them above the rack. Although for a time the men put over a thousand salmon per day above the rack, the fish accumulated in considerable numbers below the rack and this caused a great deal of complaint on the part of those who believed the rack was destroying the fish.

Dr. J. O. Snyder, of Stanford University and who is conducting the salmon investigation, made several trips to the river to quiet the fears of those who thought the rack was destroying the fish. After the water had cleared the men opened the rack so as to permit them to count the salmon quickly and accurately.

Mr. Brown, stationed at the Shasta rack, reported that up to November 3, they have counted, through the rack, 19,889 fish. These were composed of 7524 chinook salmon, 12,012 grilse (chinook salmon), 314 steelheads and 39 silver salmon.

During October, Fish Bulletins Nos. 23, 24, 25 and 26 were received from the State Printer. Bulletins Nos. 27, 28 and 29 have been completed and are ready for the printer. The third of a series of yearly catch bulletins, which is for the year 1929, is ready for the printer.

During the month of November, 18,819 tons of sardines were received at Monterey and Pittsburg, as compared with 25,867 tons in the same month last year.

The tuna canners and fishermen have been catching and canning a great many tuna during the month of November, and this industry, along with a number of others, is threatened with overproduction.

M. J. Linder resigned from the bureau laboratory during the latter part of November in order to accept a position with the United States Bureau of Fisheries. John Terry reported for work on November 10.

The annual clam census at Pismo Beach was made on November 19, 20 and 21. E. C. Scofield came down from Monterey and three staff members from San Pedro were present: Frances N. Clark, G. H. Clark and W. L. Scofield.

The extraordinarily high record of 94 per cent convictions in court cases involving California lobster law infractions was established from the first of January, 1930, to an early date in December of the same year, according to records of the patrol department of the Bureau of Commercial Fisheries.

Out of a total of 34 cases taken into court during this period, convictions were reached in 32 cases. One case was dismissed and another was settled through a verdict of not guilty. Fines totalling $1520 were imposed by Southern California judges.

In numerous instances deputies confiscated catches of under-sized or out-of-season catches. Here it was impossible to apprehend the guilty.

A bald recital of court decisions, at the same time, fails to give a complete picture of the patrol department's activities in enforcing the law. In accordance with its policy of friendly cooperation with fishermen, the patrol force had occasion time after time to warn lobster fishermen and explain the law to them without resorting to arrest and trial.

The patrol boat *Bluefin* changed her headquarters from San Pedro to Monterey for a time in December, 1930, to take over the work of the *Albacore* in general patrol and research work on Monterey Bay. During that period the *Albacore* was detailed to observe activities of the floating reduction plant "Lake Miraflores."

According to her log records, the *Albacore* first sighted the "Miraflores" on November 26, six miles southwest of Point San Pedro. Two purse seiners, the *Ambassador* and the *Emperor*, were fast alongside the reduction ship.

An exceptionally good season in 1929 was succeded by a relatively poor season in 1930 in the San Francisco shrimp fisheries, reports show.

The California shrimp fishery is the subject of a survey on which Paul Bonnot has been at work.

Ward T. Bowers, chief of the Alaska Division of the U. S. Bureau of Fisheries, visited the California State Laboratory at Terminal Island early last December. Prior to his visit he had inspected the fisheries along the Gulf of Mexico.

Data for the latest catch bulletin prepared by members of the Commercial Fisheries Bureau went to the state printer last November for publication. The bulletin will present monthly and seasonal catch totals for each variety of fish for each California port in the year 1929. These tables will be accompanied by graphs showing catch trends, by explanatory texts and by a number of special articles.

Bureau of Finance

County clerks have remitted on the 1930 series of licenses since January 1 and ending in October the following amounts: angling $109,757, hunting $28,003 and deer tags $3428. This is a total of $141,188.

Total license sales and miscellaneous collections by the division in September amounted to $24,173,67.

From all indications the total sale for the year will be about the same as the sale for 1929.

For the period ending November 30th, the total amount of remittances from county clerks to the State Controller for deer tags was $96,218.

From all indications, the hunting license sales for 1930 are not holding up as well as the sales in 1929. It appears that the sale of the 1930 series of angling licenses will show a slight increase over the 1929 series.

Bureau of Fish Culture

The number of fish planted this season up to and including September totaled 36,313,345. Fish on hand at the hatcheries on September totaled 4,215,474.

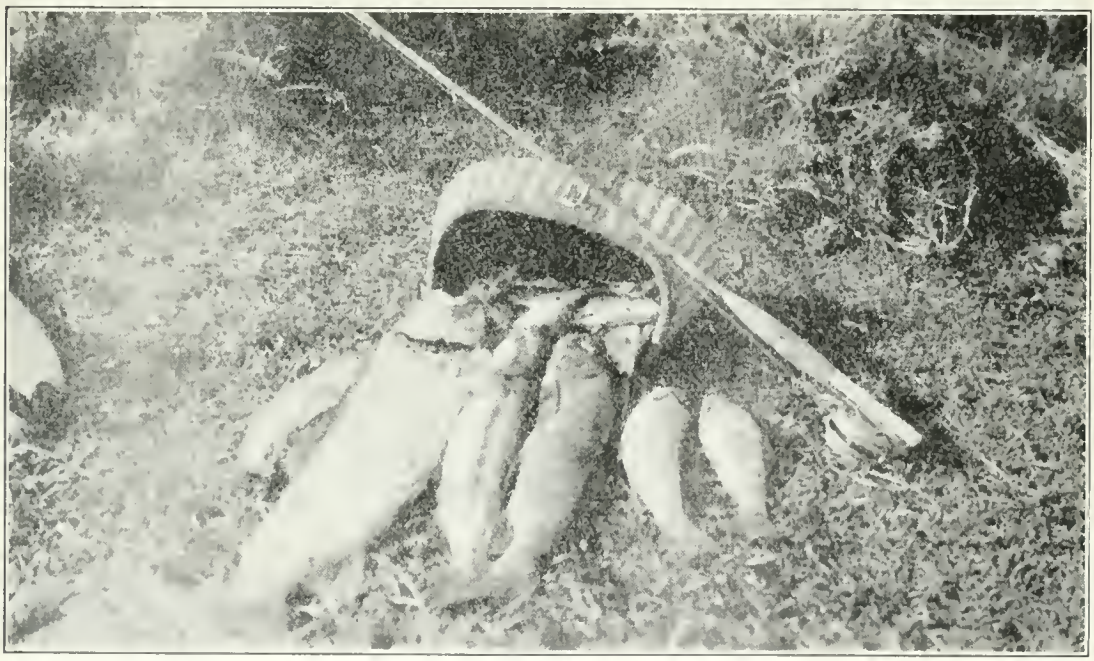


FIG. 38. Trout from Willow Creek, Lassen County. The main problem involves getting all these big fish into the one creel. Photo by E. S. Cheney, May, 1928.

During the present year, the majority of county clerks have been quite prompt in making their quarterly reports and remittances.

About the 15th of November the state printing plant delivered the 1931 series of hunting and angling licenses. The value of licenses received amounted to hunting licenses $769,000 and angling $691,000.

The only reason requiring the distribution of the hunting licenses at this time is for the fifteen days remaining of the duck season in January. The licenses will not be found useful again until the month of August.

The number of fish planted during the month totaled 6,317,249.

George A. Coleman made a study of the fish in Lake Tahoe during September. Specimens of native Tahoe trout, steelhead, eastern brook and mackinaw trout were obtained. He also made studies at the Brookdale hatchery and at the end of Elkhorn Slough in Monterey County.

About 1800 good sized striped bass were delivered and successfully planted in Salton Sea in October. This planting was a continuation of the work started in 1929.

A survey was made of conditions in the Klamath River by Mr. Coleman. A collection of the larvae of the different species of salmon flies in the Klamath River was made by employees of the Mt. Shasta hatchery.

Experiments were started in October at the Brookdale hatchery to determine the effect of the exhaust gases from outboard motors on fish life. Results obtained in November were negative.

The total number of fish shipped or planted for the season up to and including October is 38,804,944.

An experiment was carried on at Brookdale hatchery to test the use of dried animal blood as a fish food. Too much objection was found to its use on the part of the trout to make it advisable to try this product out in its crude form on a large scale.

A survey was made of the condition of the young trout fry being held in cement ponds and pontoon cages in certain San Diego County lakes. It was found that the brown trout are doing fairly well, but the rainbow are now rapidly dying off.

An experiment was carried on in securing and the transportation of ghost shrimp and mud-fish from San Diego bay to Salton Sea and planting the same. About 15,000 ghost shrimp and 500 mud-fish were successfully planted with very little loss.

A survey of conditions was made in November on Lake Elsinore. They were found to be excellent—the bass, bluegill, carp and catfish are all apparently prospering.

Early in November creeks along the coast route from San Diego north to San Francisco were found to either be bone dry or to carry very little water. A survey was also made of creeks in the vicinity of Chico and only one, Chico creek, has a steady flow of any appreciable size.

The number of fish shipped or planted for the entire season, up to and including November, totaled 39,774,293. Fish shipped and planted during November totaled 969,349.

Bureau of Education and Research

Members of the bureau assisted in various details relative to the fish and game exhibit at the State Fair in September.

Approximately a dozen lecturers were given to schools, clubs, universities and other organizations in the months of September.

E. S. Cheney made a trip to southern California where he secured his first motion pictures of mountain quail. His attempt to register the condor was unsuccessful as the great birds would not approach close enough to the blinds.

With the opening of the schools, films were much in demand during September and twenty-seven different organizations used the division reels.

Dr. Michael Hobmaier, new division pathologist, arrived from Germany in September and started to work immediately on the duck disease problem.

E. L. Summer, Jr., continued censuses of water birds at the Los Banos duck refuge. A complete record of all species seen, with relative abundance of each, is being made each month.

A questionnaire as to the use of poison in pest control has been prepared and was mailed to more than 4000 persons during September.

Gordon H. True, Jr., was appointed to serve on the Game Depredations committee of the State Chamber of Commerce.

Much work was done during September with repellents for the deer damage problem.

An attempt is being made by the library staff to secure a complete file of laws regulating the importations of birds and animals in various states. Also research work is being conducted in an attempt to compile complete information on the effect of thallium poisoning on humans and the extent to which that poison is being put in use in the different states. A third program investigated is that of plague in muskrats.

E. S. Cheney spent the greater part of October securing pictures of duck and goose shooting in Lassen County. He has also completed two additional reels on the bird life of the Los Banos refuge.

Dr. M. Hobmaier and Paul A. Shaw made a trip into northern California where they made a study of duck disease. Dr. Hobmaier also made trips to Jordan Game Farm near Woodland where he investigated a disease among pheasants.

ber, November and December. Lectures illustrated with the division's latest pictures were displayed before high schools and grammar schools, service clubs and other organizations. The bureau's representative, Rodney S. Ellsworth, gave a total of 28 lectures and reached more than 6100 persons with a message of the significance and value of wild life conservation. Though the audiences as a whole were small, they were representative of the foothill and mountainous dis-

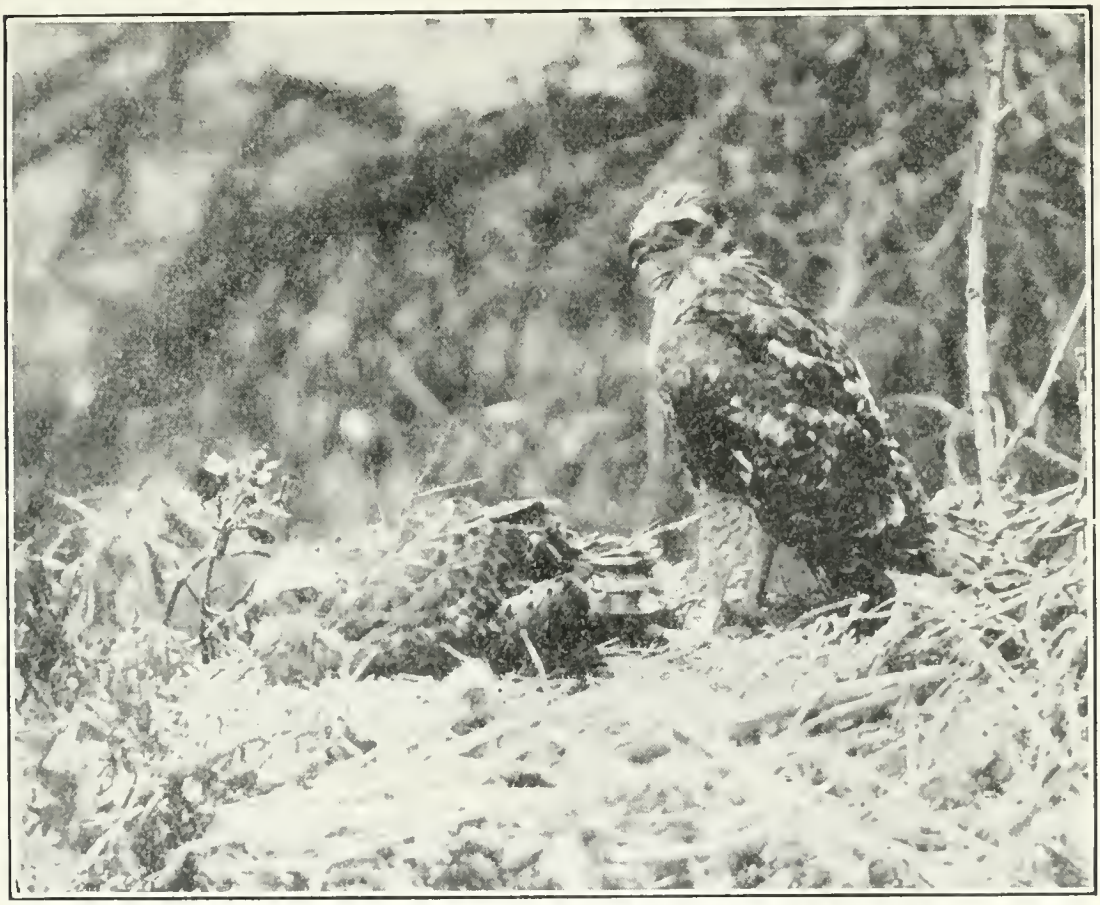


FIG. 39. Young redtail hawk. Taken on State waterfowl refuge near Los Banos. Photo by E. S. Cheney, May, 1930.

Donald McLean made investigations of deer damage to grapes between Gilroy and Watsonville.

Considerable time was spent in October by the library staff in compiling information on importation of exotic wild and domestic birds and animals, outbreaks of plague, thallium poisoning with respect to human beings eating birds and animals killed therewith.

The Mother Lode country from Nevada City, Nevada County, to Sonora, Tuolumne County, was covered during Octo-

tricts. One of the most important engagements was at Auburn on October 15. Three service clubs and the Placer County Public Anglers' Association met for a cooperative dinner and the division's pictures preceded by a talk by Ellsworth on "Game Management" were one of the features of the evening.

During November an excellent picture was taken of mountain sheep in Inyo County by E. S. Cheney.

Donald McLean, field naturalist, made a trip to San Bernardino and Los Angeles on quail refuge investigations.

Bureau of Game Refuges

Work on the Button Willow refuge for elk was started in September. About 300 acres were fenced during the month and work started on herding the animals into the enclosure.

At the Los Banos refuge water conditions were satisfactory in September and by the end of the month thousands of birds were present. Experience through the summer proved that the location is right and that water conditions will be satisfactory. The present year has been the dryest for many years in the San Joaquin Valley.

Nineteen mountain lions were turned in for bounty during September. These were killed in the following counties: Trinity 5, El Dorado 4, Shasta 2, and one each in Monterey, Tuolumne, Santa Clara, Santa Barbara, Humboldt, Madera, Mendocino and Del Norte. Lion hunter Bruce, working in El Dorado County, killed 4 and Ledshaw, in Shasta County, got 2. The kill is practically the same as the kill of September a year ago when 16 bounties were filed.

During November water was being delivered to the water fowl refuge from four supplies. Ducks and geese certainly found the area a haven during the month. It is interesting to watch the birds work into the refuge on shooting days. There has been difficulty with poachers during the month.

Twenty-two mountain lion claims were filed during October. This is the largest number since April. These lions were taken in the following counties: Trinity 5, Lake 3, Shasta 3, Tulare 2, El Dorado 2, and 1 each in Sierra, Inyo, Fresno, Plumas, Monterey, Del Norte and Santa Barbara. For the year so far, 235 claims have been filed—131 females and 104 males, as against 271 for the corresponding period last year, 155 females and 116 males.

The 1930 deer killed from a compilation of returned deer tags amounted to 24,131 bucks. This is an increase of nearly 14 per cent over the kill of 1929, and of 12 per cent over 1928, and of 23 per cent over 1927. It is interesting to note that the proportion of two, three and four-point bucks has remained practically constant during the four years the tag system has been in effect.

Mendocino is the leading county with a report of 1483 deer, Siskiyou follows with 1372, Modoc 1129, Tulare 965 and Humboldt 917. In Los Angeles County 637 deer were reported as against 691 for 1929, 369 for 1928 and 425 for 1927. On the whole the returns show a healthy condition throughout the state.

Mountain lion hunting was considerable better in November. Thirty-one lions were turned in for bounty—19 females and 12 males. This brings the total for the 11 months of the year to 268—only 20 short of the corresponding period last year. Nine lions were killed by our own hunters. The lions killed were taken in the following counties: Trinity 5, Amador 4, Humboldt 3, Glenn 3, Colusa 3, Monterey 2, Ventura 2, and one each in Tehama, Kern, Fresno, Tulare, Mendocino, Lake, Siskiyou, San Luis Obispo and El Dorado.

Bureau of Hydraulics

Recent court cases filed for oil pollution of San Pedro Harbor have very materially helped in improving conditions there.

A report of dead salmon and steelhead being found in the Klamath River, in September, was investigated for the purpose of determining the cause.

In October San Pedro Harbor continued to show signs of improvement with respect to oil pollution.

Complaint filed by Deputy F. J. McDermott for lime pollution of a creek near Santa Cruz resulted in a $200 fine. This was suspended and no further pollution is expected.

In November the San Joaquin Light and Power Company completed a good concrete fish ladder on the Merced Falls Dam on Merced River.

The Quincy Lumber Company have constructed a fish ladder at their mill pond at Sloat.

The sanitary district of San Joaquin County desires to hold water above the Woodbridge Dam on the Mokelumne River for the purpose of keeping the mosquito fish alive and thus abating the mosquito nuisance. To make this possible it will be necessary to make changes

and improvements on the fish ladder and money has been provided for this work by local contribution. The bureau has assisted and the money has been collected and the work will start shortly.

The Pacific Gas & Electric Company has made improvements on the Silver Lake fish ladder.

Improvements have been made on the Clough Dam and fish ladder.

Bureau of Game Farms

The Yountville game farm furnished exhibits of game birds and game farm equipment for three large affairs during the month of September; and the Los Serranos game farm exhibited similar work at two large fairs. Sacramento, Marysville, Bakersfield, Pomona and Riverside were the cities in which exhibits were made.

Attendants at these fair showings report an increased interest by the public in all matters pertaining to game birds and their propagation. Many more people are able to call birds by their correct names, and seem to know more about their general habits and usefulness than was the case a few years ago. Judging by the number of requests for exhibits, many of which we cannot fill, and the number of inquiries from private individuals for information as to propagation methods, it would seem that much real interest is being taken in this work.

At the recent meeting of the Western States Fish and Game Commissioners at Santa Fe, New Mexico, most of the papers read and the speeches made paid special attention to education and research, and it was interesting to note that California was mentioned as the leader in this work. In the matter of artificial incubation and brooding of game birds, but one of the eleven western states offered any competition to the program that California is carrying on—that state was Utah.

Development work was started in September at the Los Serranos game farm to get the place and equipment up to standard for higher production. It is planned to do this work with the regular force during the fall and winter. Breeding pens, watering system for lawns and additional brooding houses are included in this program.

The planting of game birds continued systematically during September and many new places were discovered for the work.

While in New Mexico August Bade, game farms superintendent, made arrangements for the introduction of new turkey blood for our flocks. This will be done by getting wild trapped birds and taming them for use in the breeding pens. Both New Mexico and Arizona have promised to help in this work. They want our system of hatching and brooding pheasants and other game birds, and we want their turkeys, so it was not difficult to come to an understanding.

Plants of birds were made at Indian and Sierra valleys in Plumas County for the first time in October. Antelope Valley, Mono County, received a second planting. Some foundation breeding stock of turkeys was given to Mono County for future work.

A turkey refuge is being planned in the Mt. Lassen district and will be stocked later in the year. There are a few turkeys in this district from an original planting made about fifteen years ago. A checkup on the turkeys in Mariposa made in October shows that the birds are doing very well, despite some reports. We found the birds nine miles from the original planting ground in a district where conditions seem very good. A letter from a Los Angeles man indicates that some of the turkeys planted in Humboldt County are doing well. He said that he came upon a flock in the wilds and wondered where they came from. A similar report gives an account of a flock of thirty turkeys found in Mt. Shasta National Forest; these birds are more than 50 miles from the original planting ground.

The two game farms produced 350 fine turkeys this year and our schedule for the future will probably increase that amount to some extent.

A new section of breeding pens for the Los Serranos game farm was built in October. It is planned to transfer two of our experienced men to the Los Serranos plant for a month in order to speed the work.

The need of some sort of control over the private breeders of the state is more evident every year. Most of these places,

due to congestion, are simply breeding places of disease. The breeders themselves suffer greatly from such a condition. We strongly recommend that steps be taken to get these places on a better basis. Standard-size equipment and inspections will help to solve the problem.

During the month of November, 580 pheasants and 105 turkeys were released for stocking purposes. The pheasants were planted at Victorville and Reseda in the southern part of the state, and at Arcata, Ferndale, Spalding Ranch, Gilroy and Santa Cruz. Turkeys were released at Big Meadows and Santa Ysabel in the south, and in Humboldt and Plumas counties in the north.

Twenty pairs of California valley quail were shipped to Montana in November in exchange of fish eggs received last spring from the Montana Commission.

The shipment of Hungarian partridges arrived from New York on November 23d. These birds came through in good condition. Exactly 643 birds left New York and 631 arrived here alive. The birds are penned in quarters that had been specially prepared for their reception—there is plenty of growing feed (greens) in the pens. We expect to liberate these birds after the first of the year.

Reports received in November on the plants of birds last year indicate that they are making fine progress and we feel sure that if protection is given them it will be only a few years until California will have the partridge in well established numbers. We are also giving special attention to the Chukor partridge (of India) as an additional partridge that we believe will fit into our plan of restocking. These birds will take to wooded sections and that is the territory that needs help in our state. With Chukor partridges, wild turkeys and Reeves pheasants for the higher elevations, these regions should take on additional life and balance the hunting activities in the agricultural sections.

We have another hundred pens well under way at the Los Serranos game farm and this will greatly increase the activities in southern California. All the work is being done by our forces. In this way we get the sort of work that best fits our needs, and at a minimum cost.

Volunteer Deputies

During the month of September the volunteer deputies did very good work in checking deer hunters and anglers in the mountain districts within the state, and in investigating reported cases of illegal killing of does, fawns and spike bucks. Working in cooperation with the regular patrol these deputies made a number of arrests in which cases fines in excess of $1,000 were imposed.

During September the volunteer deputies were active in establishing quail sanctuaries, in which work they met with spontaneous and harmonious cooperation and support of farmers and landowners in all parts of the state.

The following report received in September from Acting Forest Supervisor R. H. Blood, of the Sierra National Forest, California, will indicate how the quail sanctuary and game refuge work is progressing: "At a rough estimate, I have already received pledges covering between 300,000 and 400,000 acres, most of which is foothill country where quail abound under normal conditions. I trust that this attitude on the part of the settlers will convince the Fish and Game Commissioners that we are now in a position to protect Hungarian partridges or any other birds that may be planted in the Forest."

In the Tehachapi mountain section of the state the volunteer deputies have succeeded in having 15 of 45 sections which cover the Fickert Ranch, set aside as quail sanctuaries. The Tajon Cattle Company, Hill Bros., and the owners of other large tracts of land in that section of the state have also set aside certain parts of their land as quail sanctuaries in about the same proportion, and will issue permits to sportsmen to hunt on surrounding territory.

Reports from the volunteer deputies for the month of September indicate that quail have had more and better consideration from the out-of-door public this year than in past years. This has resulted in better breeding and the rearing of large coveys. In many cases the birds reared a second and a third brood of young.

From present indications it appears that the movement for the establishment of quail sanctuaries by the farmers and landowners on their lands, under the plan suggested by the commission, is being met with the unanimous and harmonious cooperation and support of farmers and sportsmen in every section of the state. The general opinion and expression seems to be that it is one of the best moves that has ever been undertaken to reestablish the supply of quail, and that it will prove to be an unquestioned success.

Noticeable among the activities on the part of volunteer deputies in October are those of deputies I. O. Burton of Redlands, who in coordination with regular Deputy R. Little, made fifteen arrests for violating the dove, quail and shore bird law (in which cases fines aggregating $415 were imposed); and Deputy F. Kiesling of McCloud who, unassisted, arrested a man he apprehended in the field killing a doe deer—a fine of $150 was imposed.

Volunteer deputies held a meeting on October 6 at Tehachapi, Kern County. This meeting was held in connection with a meeting of the Tehachapi Fish and Game Protective Association and was attended by about 40 volunteer deputies and members of the association. Many of those present traveled more than 50 miles to attend the meeting.

As upwards of 450 sanctuaries have been established by the end of October, it is safe to say that a goal of 500 will be reached by the end of the year.

REPORTS

SEIZURES OF FISH AND GAME

July, August, September 1930

Abalone	687
Barracuda, pounds	3,159
Bass, striped	192
Bass, black	28
Clams	1,455
Crabs	42
Lobsters	458
Lobsters pounds	160
Fish traps	36
Salmon	28
Seines, nets	1
Sunfish, perch, crappie	489
Spotfin croaker, pounds	42
Whiting	1
Trout	349
Deer	109
Deer meat, pounds	416
Deer hides, heads, horns	7
Doves	1,146
Ducks	6
Geese	3
Non-game birds	8
Quail	41
Rabbits	25
Shorebirds	1
Traps, bird	2
Squirrels, tree	3
Sage hens	11
Bear Hide	1

GAME CASES

July, August, September, 1930

Offense	Number arrests	Fines imposed	Jail sentences (days)
Hunting License Act; violations of	74	$1,604 50	100
Deer; killing does, fawns, spike bucks; closed season; no deer tags	154	8,420 00	28
Deer hides; closed season	2	25 00	
Doves; closed season; overlimit	67	1,632 00	20
Ducks; closed season	6	190 00	
Geese; closed season	3	25 00	
Non-game birds; killing of	7	75 00	5
Quail; closed season	22	555 00	4
Rabbits; closed season	17	248 00	27
Bird traps, nets; illegal	2	95 00	
Squirrel; closed season	2	25 00	
Sage hens; closed season	3	30 00	10
Bear; closed season	1	10 00	
Pheasants; closed season	3	235 00	
Pigeons; closed season	2	5 00	
Hunting in game refuge	32	1,475 00	
Night hunting	10	290 00	5
Shooting from automobile	9	175 00	50
Trespassing	1	25 00	
Grouse; closed season	1		
Commercial Gun Club License Act	1	25 00	
Totals	419	$15,164 50	249

FISH CASES

July, August, September, 1930

Offense	Number arrests	Fines imposed	Jail sentences (days)
Angling License Act; violations of	57	$1,176 00	20
Abalones; small, overlimit	23	833 00	
Barracuda; small	7	200 00	10
Bass; striped, overlimit, small	34	1,031 00	84
Bass; black, small	3	20 00	
Clams; overlimit, small	48	1,195 00	90
Crabs; small	4	120 00	
Lobsters; closed season	13	1,325 00	
Commercial Fishing License Act; no license	36	372 00	
Crappie; perch; sunfish; closed season	6	160 00	
Salmon; closed season, spearing of	2	200 00	
Seine, nets; illegal	18	825 00	180
Trout; closed season, overlimit	18	320 00	
Illegal fishing apparatus	3	35 00	
Pollution of bay, streams	5	250 00	
Night fishing	1	50 00	
Dynamiting fish	1	200 00	
Fishing too near dam	2	25 00	
Miscellaneous	1	5 00	
Totals	282	$8,342 00	384

HUNTERS KILLING TWO DEER—1930

County of residence	Number of hunters	County of residence	Number of hunters
Alameda	157	Riverside	58
Alpine		Sacramento	63
Amador	10	San Benito	36
Butte	51	San Bernardino	35
Calaveras	23	San Diego	28
Colusa	37	San Francisco	112
Contra Costa	38	San Joaquin	30
Del Norte	11	San Luis Obispo	92
El Dorado	55	San Mateo	30
Fresno	113	Santa Barbara	82
Glenn	34	Santa Clara	73
Humboldt	125	Santa Cruz	30
Imperial	7	Shasta	55
Inyo	31	Sierra	7
Kern	76	Siskiyou	119
Kings	10	Solano	36
Lake	31	Sonoma	116
Lassen	9	Stanislaus	37
Los Angeles	304	Sutter	18
Madera	23	Tehama	65
Marin	44	Trinity	20
Mariposa	10	Tulare	84
Mendocino	98	Tuolumne	17
Merced	13	Ventura	31
Modoc	3	Yolo	39
Mono	4	Yuba	12
Monterey	81	Missouri, state of	1
Napa	46	Nevada, state of	3
Nevada	17	Oregon, state of	3
Orange	43	Washington, state of	1
Placer	36		
Plumas	30	Totals	2,903

DEER KILLED IN CALIFORNIA

	Deer killed, 1927	Deer killed, 1928	Deer killed 1929	Deer killed, 1930	Land area square miles
Alameda	220	263	275	252	733
Alpine	67	66	89	124	776
Amador	59	78	87	101	601
Butte	228	212	234	314	1,698
Calaveras	149	191	175	283	1,027
Colusa	263	272	297	343	1,140
Contra Costa	5	6	14	6	714
Del Norte	42	48	55	40	1,024
El Dorado	535	548	597	685	1,737
Fresno	592	763	764	893	5,950
Glenn	623	592	586	601	1,337
Humboldt	821	777	689	917	3,575
Imperial	1	4	4	1	4,089
Inyo	173	239	253	251	9,991
Kern	218	295	297	324	8,003
Kings	3	3	3	12	1,159
Lake	901	1,038	841	885	1,238
Lassen	296	393	511	585	4,531
Los Angeles	425	369	691	637	4,115
Madera	260	300	313	379	2,112
Marin	367	444	394	403	529
Mariposa	95	134	144	235	1,463
Mendocino	1,475	1,468	1,355	1,483	3,539
Merced	67	68	48	68	1,995
Modoc	510	729	835	1,129	3,823
Mono	36	55	76	73	3,030
Monterey	757	830	734	864	3,330
Napa	442	569	523	536	783
Nevada	125	140	169	236	974
Orange	56	69	81	90	794
Placer	341	346	335	340	1,411
Plumas	551	586	695	764	2,593
Riverside	323	249	404	629	7,223
Sacramento	0	2	0	2	983
San Benito	217	320	269	313	1,392
San Bernardino	74	122	120	188	20,175
San Diego	169	232	233	250	4,221
San Francisco	0	0	0	0	42
San Joaquin	21	14	22	22	1,448
San Luis Obispo	394	450	455	568	3,334
San Mateo	77	89	102	100	447
Santa Barbara	669	851	717	777	2,740
Santa Clara	397	536	577	650	1,328
Santa Cruz	78	92	102	115	435
Shasta	612	603	702	655	3,858
Sierra	101	102	132	137	923
Siskiyou	1,665	1,654	1,211	1,372	6,256
Solano	45	52	54	58	822
Sonoma	751	753	732	865	1,582
Stanislaus	91	115	119	111	1,450
Sutter	1	3	2	1	608
Tehama	799	846	758	845	2,925
Trinity	921	800	751	760	3,096
Tulare	744	939	807	965	4,856
Tuolumne	213	213	212	280	2,190
Ventura	274	362	346	308	1,878
Yolo	115	169	176	214	1,014
Yuba	53	52	55	93	632
Totals	19,507	21,515	21,222	24,132	155,672

STATISTICS ON DEER KILL, SEASON 1930

County where deer was killed	County of residence of hunter																			
	Alameda	Alpine	Amador	Butte	Calaveras	Colusa	Contra Costa	Del Norte	El Dorado	Fresno	Glenn	Humboldt	Imperial	Inyo	Kern	Kings	Lake	Lassen	Los Angeles	Madera
Alameda	190						15			1	1								1	
Alpine	14	3	9		15		1												3	
Amador	12		45		3		4		1	1									1	
Butte	8			236		2	6			3								1	5	1
Calaveras	9		6		139		9			5					1				2	
Colusa	17			9		156	24			1	8						6		3	
Contra Costa							6													
Del Norte								30				9							1	
El Dorado	29		34	3		3	7		324	3					2				8	
Fresno	8						4			535				2	33	25			119	6
Glenn	33			47		60	10			1	156		2		4				20	1
Humboldt	50				1		9	1		1		620			3				42	
Imperial																				
Inyo	2													127	7				84	
Kern										1			1		197				89	
Kings										2					2	3				
Lake	103			1		46	43			6	3	1	3	1		4	223		24	
Lassen	27		1	17		14	9		2	8	9	1			6	3	10	163	29	
Los Angeles										1					7				567	
Madera	7				1					116				1	9	5			41	137
Marin	19						3								2				1	
Mariposa	11						3			9				1					9	23
Mendocino	150			11		3	45			7	14	19	1			3	7		50	
Merced										2					1					
Modoc	41			22		26	21			19	29	14	3		4	6	52	12	45	2
Mono	1													24					19	
Monterey	15						2			13					4	2			31	
Napa	49				1		12			1					1	1	2			
Nevada	11					1	3												3	
Orange																			19	
Placer	13						6		22										25	
Plumas	41		1	59		4	14			2	8				9		3	44	36	
Riverside													11						202	
Sacramento																				

San Benito	5						1			11						1			5	1
San Bernardino	1																		41	
San Diego													7						30	
San Francisco																				
San Joaquin	2			1			1													
San Luis Obispo										4					32	1			18	
San Mateo	2																			
Santa Barbara															86	3			92	1
Santa Clara	46						8								1				9	
Santa Cruz	6						1									1			1	
Shasta	37		2	17		8	10			2	5	2			5		8	8	36	3
Sierra	4			2			2		2	1									1	1
Siskiyou	77		1	7	2	5	22	7		5	5	15	9		12	6	10		81	1
Solano	5									1										
Sonoma	53			2		2	20			1			1				5		10	
Stanislaus	6						1												2	
Sutter																				
Tehama	37			54		21	10			2	63	7	1				6	3	78	
Trinity	66			4		1	6	5		4	2	146			5		1	1	50	
Tulare	3									21			1	26	114	31			302	
Tuolumne	21				22		3								2				1	1
Ventura															18	1			119	
Yolo	15			5		2	6						2		2		2		7	
Yuba	6			7																
Totals	1,252	3	99	504	184	354	347	43	351	790	303	834	42	182	569	96	335	232	2,362	178

STATISTICS ON DEER KILL, SEASON 1930—Continued

County where deer was killed	County of residence of hunter																		
	Marin	Mariposa	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside	Sacramento	San Benito	San Bernardino	San Diego	San Francisco	San Joaquin	San Luis Obispo
Alameda										1				1				13	5	1
Alpine				4							1			3				1	35	
Amador														14				3	11	
Butte				1						6	4			3		1	2	5	1	
Calaveras				2										5	1			9	63	
Colusa	3							4			2			24				9	7	
Contra Costa																				
Del Norte																				
El Dorado	1		2	3			3	2	2	1	43			154	1	1	1	6	13	
Fresno				4			6			7			2	1	5	3	4	4	1	5
Glenn	2		4	3				3	7	3	7		3	31		1	2	23	17	
Humboldt	5		25					2	3				3	9		1	13	58	4	
Imperial																	1			
Inyo						2				3			6			13	4			
Kern						1				6			1			9	1			1
Kings																				4
Lake	9		20				2	58		6	3		4	37	2		1	94	16	
Lassen	1		8		20		2	11		4	11	9	1	35			4	16	8	2
Los Angeles										6			3			4	2	3		
Madera		4		19		3								1		12		2		3
Marin	230			1			2							4	1			71	1	
Mariposa		76		48			2			1								6	2	
Mendocino	44		553	4			4	17	1	8			1	19		3	2	239	21	4
Merced				39										1	7			1		
Modoc	24	1	33	14	213	1	23	20		10	10	2	1	37	15		18	29	18	17
Mono						21							1			1				
Monterey	1	1		3			549			8	2			2	8	2		13	1	76
Napa	1							278			2			14		2		40	5	
Nevada	2			1				2	121		25			16				8		
Orange										67			2				1			
Placer	1				1			4	9		156			42				20	13	1
Plumas	2		2	1			6	6		9	13	276		22		2	6	23	13	
Riverside										58			269			60	29			
Sacramento														1						

San Benito			1	5			31			1					194		1	8		
San Bernardino										15			22			107	1			
San Diego										14	2		8				189			
San Francisco																				
San Joaquin																			13	
San Luis Obispo	1			1			13			4			1			4	1	5		420
San Mateo																		8		
Santa Barbara	1						1			31					2	5	1	2	2	38
Santa Clara	3			4			16			2				2	32			42	4	1
Santa Cruz										1								10		
Shasta	4		4	2	4		1	10		1	3	3		15		2		26	1	2
Sierra	4						1		12	1	10	7		8				15		
Siskiyou	3		4	4	4		10	15		11	4		1	22	1	5	6	41	13	1
Solano								2												
Sonoma	29		4	2				21					1	8			2	129	5	
Stanislaus				21												1		3	9	
Sutter																				
Tehama	1		6	5			9	19	2	8	13	8		20		2	4	45	13	2
Trinity	13		36	1	2		1	4	4		3			15		1	9	48	4	3
Tulare							1			30			4	1		16	3		1	2
Tuolumne	1	2		3										2	2		1	5	24	3
Ventura										3			2	2		2	1			1
Yolo	3	1						1						14				6	1	
Yuba							1		1					10	1			2	2	
Totals	389	85	702	195	244	28	684	479	162	326	314	305	336	595	272	260	310	1,091	347	587

STATISTICS ON DEER KILL, SEASON 1930—Continued

County where deer was killed	County of residence of hunter																			
	San Mateo	Santa Barbara	Santa Clara	Santa Cruz	Shasta	Sierra	Siskiyou	Solano	Sonoma	Stanislaus	Sutter	Tehama	Trinity	Tulare	Tuolumne	Ventura	Yolo	Yuba	Non-residents	Totals
Alameda	7		11	4				1												252
Alpine										27					4				4	124
Amador	1	1	2							2										101
Butte		2		1				3		1	11	2					4	5		314
Calaveras	1		2					1		22	1				5					283
Colusa	3		4	2	1			6	4	3	15	1		1			24	5	1	343
Contra Costa																				6
Del Norte																				40
El Dorado	2		3	1				11	3	6	3			1			3	4	2	685
Fresno	1		5	2			3			4				95		9				893
Glenn	1		5	3				28	7	5	23	29		2			47	7	4	601
Humboldt	4	1	9	3				1	27	3		2	9		1	2	5			917
Imperial																				1
Inyo		1												1		1				251
Kern	2	1								1				7		6				324
Kings			1																	12
Lake	20		11	1				38	60	6	12	1		2			24			885
Lassen	5		11	26	15	1	3	14	28	14	11	8		3			8	5	2	585
Los Angeles		4												1		39				637
Madera	3		3							10				2						379
Marin	11		1					2	53	1										403
Mariposa	3		4					1		25				3	4		4			235
Mendocino	43	6	16	3				28	128	4	1	7		2			12	1	2	1,483
Merced	1		3	10						3										68
Modoc	12	15	27	24	18		19	14	77	23	21	7		12	1	13	35	16	13	1,129
Mono															1	3			2	73
Monterey	6	10	20	79				3	1	5				2		5				864
Napa	11		4	3				62	18	1								28		536
Nevada			2	1		4		5		1	4	1				1	1	16	7	236
Orange																1				90
Placer	3		4					3	2	4	3						1	7		340
Plumas	4		16	3	2	26	1	16	7	10	31	8		5		1	17	12	3	764
Riverside																				629
Sacramento									1											2

San Benito	1		30	13						3				1						313
San Bernardino																1				188
San Diego																				250
San Francisco																				
San Joaquin	1			2						2										22
San Luis Obispo	1	45	3	2				2	1	2				1		6				568
San Mateo	75		10	4						1										100
Santa Barbara	1	459		2										3		47				777
Santa Clara	33	2	426	14					2	3										650
Santa Cruz	5		14	76																115
Shasta	10		18	13	306		19	10	13	4	4	24		2	3	1	6	1		655
Sierra						49		1	1		2						2	7	4	137
Siskiyou	9		12	9	27		802	11	20	8	6	10	1	5	1		1	3	37	1,372
Solano								43						1			6			58
Sonoma	12		7	2				10	534	2		1					1		1	865
Stanislaus	1			2				1		61					3					111
Sutter											1									1
Tehama	5		17	2	17	1	1	19	36	19	27	228		2			25	6	1	845
Trinity	11		12	8	35		7	7	55	15	2	19	136	1		2	7	5	3	760
Tulare	2	8	1	1						2				381		14				965
Tuolumne	1	2	3					1	1	37				1	141					280
Ventura		4														155				308
Yolo			1					6						2			137	1		214
Yuba						1		1	1		8						2	50		93
Totals	312	561	718	316	421	82	855	349	1,080	340	186	348	146	539	164	307	372	179	86	24,132

DEER KILLED IN DISTRICTS 2-2½-3, AUGUST 1-SEPTEMBER 14, 1930

	Aug. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Alameda	34	18	25	10	6	1	7	7	2	22		4	1		5	5	4			1	4	4	5
Colusa	62	27	31	15	11	3	7	5	9	12	1	4	1	1	3	7	11	2	3	3		6	3
Contra Costa	2	1								1													
Fresno	15	4	3	3	6	2	3	1	1	6	3		2	2	1		4		1	2	2	1	1
Glenn	143	65	58	19	26	15	13	12	3	19	6	7	6	6	5	11	14	8	6	4	10	6	2
Kern	15	3	7	2		2	2		1	3		1		2			2	1		2			1
Kings	3	4	1	1													2						
Lake	144	62	72	34	23	21	18	12	16	36	10	14	5	7	12	13	21	11	7	10	6	11	11
Marin	47	17	17	5	7	10	5	5	12	17	4	1	7	4	6	11	12	4	5	8	8	2	5
Mendocino	175	104	82	43	30	39	19	34	31	51	14	22	19	20	33	25	52	5	16	15	19	16	24
Merced	8	4	5	1	1		2		3	6						1	4	2	2	1	1		
Monterey	106	70	72	23	19	17	14	14	21	24	4	9	9	8	7	21	27	8	9	9	4	7	15
Napa	59	32	46	2	6	7	10	5	14	24	2	6	7	3	7	4	25	7	7	5	7	2	13
San Benito	42	19	23	3	9	10	7	4		20	5	3	2	9	1	1	21	2	1	3	3	2	2
San Francisco																							
San Joaquin	6		2							1						1		2					
San Luis Obispo	57	36	42	13	11	14	13	10	8	25	6	6	5	8	8	10	15	4	7	6	7	8	4
San Mateo	11	5	5		2		2	1	3	7			1	2	1		1		2	1			1
Santa Barbara	157	68	60	18	11	15	6	16	12	25	10	11	7	9	9	12	15	9	11	9	5	6	3
Santa Clara	79	62	36	13	15	11	5	10	14	23	2	9	9	6	9	15	23	8	2	6	11	4	7
Santa Cruz	22	7	10	2	3	3	3	1	1	8	1	3	1	3	1	2	6	2		2		2	4
Solano	8	2	7	1	3			1		3			1									1	1
Sonoma	78	48	58	18	15	15	8	17	14	19	5	14	7	12	12	26	41	8	12	7	5	8	11
Stanislaus	22	6	1	2	2				1	11			1	1	2	2	5	1		1			3
Ventura	71	21	26	7	6	8	7	7	1	12	2	8	4	4	1		9	6	3	1	5	4	3
Yolo	41	10	15	1	2	4		3	8	8	1	1	1	7	3	6	12		2	4		2	1
Totals	1,407	695	704	236	214	197	151	165	175	383	76	123	96	114	126	173	326	90	96	100	97	92	120

DEER KILLED IN DISTRICTS 2-2½-3, AUGUST 1-SEPTEMBER 14, 1930—Continued

	24	25	26	27	28	29	30	31	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Totals
Alameda	8		1		3	2	1	10		2	2	1	2	3	12	1	5		1	5	6	22	252
Colusa	11	2	2		6	2	3	13	14	3	1	1	2	1	11	3	8	4	4	6	8	11	343
Contra Costa								1									1						6
Fresno	2					2		4	2				1	2	4		1	3			1	1	86
Glenn	13	4	6	5	5	3	7	19	13	2	2	2	2	7	8	7	2	7	5	1	10	7	601
Kern		1					1	2							1	1		2	1	1	1	1	56
Kings			1																				12
Lake	23	5	4	7	9	4	11	22	25	7	4	6	8	10	25	13	17	15	8	19	26	41	885
Marin	15	3	2	2	6	2	9	18	15	7	1	6	7	8	11	6	6	3	7	12	13	25	403
Mendocino	35	14	8	9	17	14	23	45	31	9	13	10	22	12	41	41	25	26	24	47	53	76	1,483
Merced	5	1					1		1						4		1			2	9	1	66
Monterey	25	4	2	6	7	7	10	32	18	7	4	12	7	12	32	18	20	10	16	19	31	48	864
Napa	18	3	6	3	3	5	9	18	15	3	2	6	3	10	25	6	13	4	12	12	19	41	536
San Benito	9	1	3	1	3	1	2	8	3	2		6	4	5	15	2	5	4	11	10	9	17	313
San Francisco																							
San Joaquin		1							4	2						1					1	1	22
San Luis Obispo	21	4	6	4	2	9	8	11	8	4	6	4	4	17	13	7	5	5	11	16	22	58	568
San Mateo	9		2	2	2		2	9	4	1	2	3	2	1	4			1		1	2	8	100
Santa Barbara	10	8	3	6	6	3	8	27	16	4	6	3	3	11	32	8	10	9	13	19	29	39	777
Santa Clara	20	1	4	3	7	6	11	23	13	4	2	4	6	5	27	8	21	4	13	12	25	52	650
Santa Cruz	4		3		1	1	1	5	4				2	2	1	1	2		1				115
Solano	2		1				1	4	3	2				1	1	2	1	1	5	2	1	3	58
Sonoma	28	10	3	4	9	9	19	45	24	7	9	9	11	10	45	10	22	9	16	11	26	71	865
Stanislaus	4	1		2	1		2	2	1			1		2	1	2	2	1	2	2	4	11	102
Ventura	11	1	1	2	5	3	4	10	3	4	1	2		5	6	3	2	3	2	2	11	11	308
Yolo	6	3	1	1	4		1	5	1	1	3	2	3	3	11	4	7	3	4	1	6	12	214
Totals	279	67	59	57	96	73	134	333	218	71	58	78	89	127	330	144	176	114	156	200	313	557	9,685

DEER KILLED IN DISTRICTS 1-1½,-1¾-4-4½-4¾, SEPTEMBER 1-OCTOBER 15, 1930

	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Alpine																42	23	17	6	6	2	1	
Amador																21	2	7	3	6	8	1	1
Butte																30	15	9	14	10	15	9	11
Calaveras																34	18	12	7	12	22	7	9
Del Norte	9	2	1	2	3	1	5			2			2		1	1			2				
El Dorado																103	65	28	15	20	43	7	13
Fresno																139	84	68	39	41	35	11	34
Humboldt	93	38	29	18	17	18	39	28	36	15	16	14	18	36	8	14	6	5	7	11	25	12	13
Imperial																							
Inyo																53	20	20	8	14	16	8	4
Kern																37	18	9	9	15	25	9	3
Kings																							
Lassen																121	58	36	25	23	33	14	7
Los Angeles																101	17	18	7	18	31	21	7
Madera																85	51	25	27	23	20	3	2
Mariposa																28	8	6	5	3	12	2	5
Merced																							
Modoc																158	102	87	63	55	50	23	33
Mono																7	8	2	1	3	5	3	
Nevada																23	13	9	5	15	18	1	6
Orange																1	3	2		4	5		2
Placer																55	22	18	13	8	30	4	16
Plumas																132	77	38	46	39	34	20	30
Riverside																190	67	26	16	11	23	5	8
Sacramento																		1					
San Bernardino																23	8	8	3	5	19	2	2
San Diego																45	18	11	9	8	12	3	1
San Joaquin																							
Shasta																72	33	39	27	20	24	10	19
Sierra																20	9	6	1	2	11	2	10
Siskiyou	152	49	40	29	17	18	29	20	22	19	22	17	12	20	12	100	68	47	36	32	36	13	25
Stanislaus																2	1						
Sutter																							
Tehama																54	40	41	29	20	27	13	17
Trinity																87	46	52	36	37	32	20	22
Tulare																223	110	71	49	47	34	28	25
Tuolumne																49	15	12	13	11	16	1	3
Yuba																4	5	5	7	8	2	4	1
Totals	254	89	70	49	37	37	73	48	68	36	38	31	32	56	21	2,054	1,030	735	528	527	665	257	319

DEER KILLED IN DISTRICTS 1-1½-1¾-4-4½-4¾, SEPTEMBER 1-OCTOBER 15, 1930—Continued

	24	25	26	27	28	29	30	Oct. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Alpine		3	4	6	4	1	3	1				1	1							1		2	124
Amador	2	4	1	4	7	1	1	1	1	3	1	11		2	1		2	1	4			5	101
Butte	9	4	3	8	17	4	6	11	6	7	2	20	2	7	5	7	7	10	27	9	14	16	314
Calaveras	6	6	4	6	16	5	5	6	5	5	4	10	1	2	9	4	5	10	21	5	14	13	283
Del Norte		1			1							2							1	1	2	1	40
El Dorado	13	14	17	14	35	8	16	9	8	9	12	32	8	7	9	10	13	22	46	25	24	40	685
Fresno	6	12	19	15	19	5	14	16	10	17	12	33	5	15	10	6	12	27	46	19	22	26	807
Humboldt	27	18	15	21	30	14	8	10	10	6	15	22	13	11	11	16	12	23	45	20	34	20	917
Imperial											1												1
Inyo	1	3	4	5	7	3	3	3	4	2	3	10	2	3	5	4	2	12	15	5	5	7	251
Kern	5	5	4	8	17	3	3	6	6		6	10	4	5	1	5	6	3	17	6	10	13	268
Kings																							
Lassen	9	10	3	15	23	6	7	9	8	10	5	16	9	11	14	8	12	18	34	8	15	18	585
Los Angeles	10	7	6	13	39	5	11	8	15	4	11	58	8	2	8	13	22	34	69	14	27	33	637
Madera	6	3	4	7	10	5	3	7	2	1	11	14	3	4	8	2	9	12	11	3	7	11	379
Mariposa	4	3	4	1	10	2	18	2	6	4	8	15	5	2	5	1	5	23	29	5	7	7	235
Merced											1				1								2
Modoc	33	33	25	18	26	12	12	14	18	11	18	31	18	14	27	32	28	30	40	42	31	45	1,129
Mono	2	3	1	3	3	1	3	5	3	1	2		2			2	4	1	2	2	3	1	73
Nevada	3	3	4	7	21	1	3	4	3	3	5	11	1	8	7	4	5	8	18	9	4	14	236
Orange	6			2	3		2	1	3	2	3	5		1	1		5	2	9	3	13	12	90
Placer	4	3	5	10	9	7	4	10	7	1	3	10	6	6	2	4	5	10	22	12	14	30	340
Plumas	31	18	17	13	20	13	9	18	14	16	9	19	8	10	8	8	13	17	24	16	19	28	764
Riverside	7	4	3	7	14	6	3	7	4	13	11	25	7	10	9	7	8	32	53	20	20	23	629
Sacramento																						1	2
San Bernardino	2	2	1	4	10		4	1	1	2	1	6	5	3	4	8	11	7	18	8	7	11	188
San Diego	1	3	3	6	10	2	6	5	5	1	4	8	2	3	1	4	5	18	19	15	6	16	250
San Joaquin																							
Shasta	18	19	21	16	20	17	15	23	16	10	10	26	12	11	11	23	13	19	26	25	31	29	655
Sierra	2	7	2	1	4	5	1	5	3	2	2	10	2	1	2	2	2	1	3	5	6	8	137
Siskiyou	20	25	16	22	35	19	8	15	10	16	19	29	15	13	12	21	27	27	52	48	29	49	1,372
Stanislaus				1								3		2									9
Sutter															1								1
Tehama	23	20	16	21	16	8	10	21	15	15	22	16	8	15	16	38	32	36	65	68	54	69	845
Trinity	26	28	18	18	24	14	13	19	22	13	20	21	14	15	20	10	14	24	28	24	25	18	760
Tulare	20	10	14	19	13	11	10	10	12	7	10	23	16	17	14	16	23	20	36	27	29	21	965
Tuolumne	7	4	3	6	13	1	9	4	5	3	6	16	1	6	2	5	6	7	29	7	12	8	280
Yuba		1	4		1	3		4	4		2	4	1	3	2	4	3	1	9	5	1	5	93
Totals	303	276	241	297	477	182	210	255	226	184	239	517	179	209	226	264	311	447	818	457	485	590	14,447

STATEMENT OF EXPENDITURES

For the Period July 1, 1930, to September 30, 1930, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Administration:					
Executive	$1,500 00				$1,500 00
Clerical and office	5,229 52	$262 93	$106 71	$93 08	5,692 24
Printing		148 25			148 25
Automobiles		72 36	16 50	1,483 90	1,572 76
Traveling			524 34		524 34
Postage			1,393 06		1,393 06
Telephone and telegraph			777 28		777 28
Freight, cartage and express			892 22		892 22
Rent			3,851 67		3,851 67
Heat, light and power			27 44		27 44
Accident and death claims			4,350 18		4,350 18
Accounting pro rata	1,125 00				1,125 00
Legal	1,650 00			2 85	1,652 85
Publicity			13 00		13 00
Total, administration	$9,504 52	$483 54	$11,952 40	$1,579 83	$23,520 29
Education and research:					
Chief and assistant	$2,625 00				$2,625 00
Clerical and office	480 00	$90 73	$47 20	$94 38	712 31
Traveling			1,600 68		1,600 68
Freight, cartage and express			1 50		1 50
Photographer	300 00		25 50	116 70	442 20
Librarian	412 90	1 25	19 00	20 58	453 73
Research	1,275 00	101 40			1,376 40
Publicity			135 01		135 01
Temporary help	200 00				200 00
Summer educational work	546 68				546 68
Total, education and research	$5,839 58	$193 38	$1,828 89	$231 66	$8,093 51
Patrol and law enforcement:					
Chief and assistants	$2,685 00				$2,685 00
Clerical and office	807 50	$110 81	$8 82	$48 03	975 16
Automobiles		2,120 80	778 33	8,525 10	11,424 23
Traveling			33,420 66		33,420 66
Postage			98 80		98 80
Telephone and telegraph			308 48		308 48
Freight, cartage and express			34 68		34 68
Rent			172 25		172 25
Captains and deputies	52,527 29	34 33	34 60		52,596 22
Launches	510 00	236 54	1,470 44	165 90	2,382 88
Fish planting	1,342 06	364 48	59 50		1,766 04
Volunteer deputies	155 00				155 00
Premiums on bonds			360 00		360 00
Temporary help	20 00				20 00
Total, patrol and law enforcement	$58,046 85	$2,866 96	$36,746 56	$8,739 03	$106,399 40
Commercial fisheries:					
Chief and assistants	$2,595 00				$2,595 00
Clerical and office	2,295 00	$7 14	$35 20		2,337 34
Automobiles		125 96	51 00		176 96
Traveling			3,981 67		3,981 67
Postage			97		97
Telephone and telegraph			57 18		57 18
Freight, cartage and express			21 08		21 08
Rent			197 50		197 50
Heat, light and power			42 69		42 69
Research	2,400 00	5 00		$43 63	2,448 63
Inspectors	2,976 80				2,976 80
Captains and deputies	3,705 00	30 56	5 15		3,740 71
Launches	3,174 69	1,771 26	1,257 58	2,125 65	8,329 18
Laboratory	8,285 05	183 04	981 90	213 91	9,663 90
Fish tags		202 00			202 00
Salmon tagging			1 00		1 00
Botulism			3,750 00		3,750 00
Statistics	735 00	299 00			1,034 00
Total, commercial fisheries	$26,166 54	$2,623 96	$10,382 92	$2,383 19	$41,556 61

STATEMENT OF EXPENDITURES—Continued

For the Period July 1, 1930, to September 30, 1930, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Fish culture:					
Chief and assistants	$1,650 00				$1,650 00
Clerical and office	975 00	$33 89	$9 68		1,018 57
Automobiles		1,381 51	484 96	$4,335 88	6,202 35
Traveling			3,914 82		3,914 82
Postage			29 00		29 00
Telephone and telegraph			319 10		319 10
Freight, cartage and express			470 80		470 80
Rent			259 29		259 29
Heat, light and power			194 07		194 07
Hatcheries	35,922 16	24,964 61	423 69	717 41	62,027 87
Hatcheries—additions and betterments				4,997 84	4,997 84
Special field investigations	3,458 00	158 48	25 00		3,641 48
Fish cars	1,439 84	217 84	334 28	3 95	1,995 91
Blue printing			4 20		4 20
Total, fish culture	$43,445 00	$26,756 33	$6,468 89	$10,055 08	$86,725 30
Hydraulics:					
Chief and assistants	$1,545 00		$2 70		$1,547 70
Clerical and office		$12 20	3 52		15 72
Automobiles		87 49	37 00	$1,077 50	1,201 99
Traveling			313 51		313 51
Telephone and telegraph			2 49		2 49
Blue printing			12 40		12 40
Cooperative research	750 00				750 00
Total, hydraulics	$2,295 00	$99 69	$371 62	$1,077 50	$3,843 81
Game propagation:					
Superintendents	$1,880 00				$1,880 00
Automobiles		$156 97	$1 00		157 97
Traveling			355 19		355 19
Postage			5 00		5 00
Telephone and telegraph			47 76		47 76
Freight, cartage and express			30 63		30 63
Heat, light and power			369 97		369 97
Maintenance		3,051 66	121 38	$1,259 30	4,412 34
Temporary help	1,205 64				1,205 64
Assistants	1,140 00				1,140 00
Total, game propagation	$4,225 64	$3,208 63	$930 93	$1,239 30	$9,604 50
Fish rescue:					
Chief and assistants	$1,155 00	$9 75	$35 00		$1,199 75
Traveling			588 97		588 97
Rent			30 00		30 00
Total, fish rescue	$1,155 00	$9 75	$653 97		$1,818 72
Game refuges:					
Chief and assistants	$999 99				$999 99
Clerical and office	656 00				656 00
Automobiles		$91 32	$56 95	$1,136 32	1,284 59
Freight, cartage and express			50		50
Traveling			272 25		272 25
Lion hunters and trappers	2,287 00				2,287 00
Refuge posting	1,710 00	4 80			1,714 80
Predatory animal control			840 00		840 00
Refuge maintenance		158 31	38 68	86 55	283 54
Total, game refuge	$5,652 99	$254 43	$1,208 38	$1,222 87	$8,338 67
License commissions					$9,651 55
State fair and other exhibits					$3,997 06
Prior year expense—81st fiscal year only					$1,979 03
Prior year expense—80th fiscal year only					$17 87
Grand total, proprietary group					$305,510 58

STATEMENT OF INCOME

For the Period July 1, 1930, to September 30, 1930, of the Eighty-second Fiscal Year

	Detail	Total
Departmental income—license sales:		
Angling licenses, 1930	$140,701 50	
Commercial hunting club licenses, 1930-1931	1,100 00	
Commercial hunting club operators licenses, 1930-1931	255 00	
Deer tags, 1930	10,603 00	
Fish importers' licenses, 1930	10 00	
Game breeders' licenses, 1930	85 00	
Hunting licenses, 1930	46,410 70	
Market fishermen's licenses, 1930-1931	20,040 00	
Trapping licenses, 1930-1931	65 00	
Wholesale fish packers' and shell fish dealers' licenses, 1930-1931	775 00	
Wholesale fish packers' and shell fish dealers' licenses, 1929-1930	5 00	
Total license sales		$220,050 20
Other income:		
Court fines	$14,682 44	
Fish packers' tax	10,510 82	
Fish tag sales	759 37	
Game tag sales	24 24	
Interest on bank balances	1,648 06	
Kelp tax	45 63	
Miscellaneous sales	301 70	
Total other income		27,972 26
Total departmental income		$248,022 46
Income for the state university fund:		
Kelp tax	$22 80	

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1930

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Albacore								346	60,646
Anchovies							161,370	400	6,600
Barracuda								30	
Bonito								447	
Carp				1,782	1,089	5,542			
Catfish				1,089	50,784	28,877			
Cultus Cod	40,235	25,145					159,648	14,159	10,402
Flounders	5						48,084	3,406	68
Grayfish							44,505	125	
Hake							12,937	750	
Halibut	171,531	12,038					13,132	3,281	1,659
Herring							344		
Kingfish							19,067	3,563	1,569
Mackerel							4,082	10,423	370,102
Mackerel—Horse									40,224
Mackerel—Spanish									
Mullet									
Perch	5,561		4,026				23,233	371	3,326
Pike					54	93			
Pompano								43	
Rock Bass									
Rockfish	30,775	4,269					324,215	317,069	387,400
Sablefish	290,809	2,275					166,884	28,263	2,532
Salmon	1,527,519	983,701		112,028	209,994	293,298	809,193	18,582	25,794
Sandabs							178,888	20,868	2,192
Sardines							12,440,987	65	61,890,521
Sculpin									
Sea Bass—Black									
Sea Bass—White			5,166				14,127	43,865	514
Shad	3			47	89	3,182	35		
Shad—Buck					10				
Shad—Roe					10				
Sheepshead									

Skates							70,660	5,180	788
Skipjack									
Smelt	8,333	1,165	7,454			598	31,958	44,520	119,897
Sole	2,052						1,830,097	191,180	23,855
Splittail					255	1,199			
Striped Bass				22,383	10,494	149,319	21,230		
Swordfish									
Tomcod							9,261		
Tuna—Bluefin									
Tuna—Yellowfin									
Turbot			178				5,145		
Whitebait	12,238	10,093					6,934		24
Whitefish									
Yellowtail									
Miscellaneous	33,895	270			15	121	2,313	1,250	30
Total fish	2,122,956	1,038,956	16,824	137 329	272,794	482,229	16,398,329	708,186	62,948,143
Crustaceans:									
Crabs	[1]3,216						[3]89,208	[5]96	
Shrimps			726,108				675,046		1,230
Mollusks:									
Abalones									973,105
Clams—Cockle			8,470						
Clams—Mixed	506		200						
Clams—Pismo									605
Clams—Softshell			15,871			4,105	2,871		
Cuttlefish							2,227	50	20,593
Oysters—Eastern			[2]27,016				[4]70,180		
Oysters—Native			3,157				8,000		
Squid									1,523
Miscellaneous:									
Terrapins					58				
Total	2,126,678	1,038,956	797,646	137,329	272,852	486,334	17,245,861	708,332	63,945,199

[1] 134 dozen.
[2] 122,800 shell oysters.
[3] 3,717 dozen.
[4] 319,000 shell oysters.
[5] 4 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1930—Continued

	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into San Pedro.	Fish from south of the International Boundary brought into San Diego.	Total fish from south of the International Boundary brought into California.
Albacore		13,904		2,077	76,973			
Anchovies		1,415	283		170,068			
Barracuda	1,819	1,080,856	23,590	403,788	1,510,083	115,032	67,810	182,842
Bonito	470	2,000,621	12,232	974,851	2,988,621	1,076,837	47,190	1,124,027
Carp					8,413			
Catfish					80,750			
Cultus Cod	265	330			250,184			
Flounders		143	4		51,710			
Grayfish	30	69,115	23,066	44,236	181,077			
Hake					13,687			
Halibut	81,849	47,341	1,933	1,903	334,667	7,414	116,247	123,661
Herring					344			
Kingfish		50,282	198	131	74,810			
Mackerel	704	1,574,938	21,419	113,860	2,095,528		719	719
Mackerel—Horse		61,279			101,503			
Mackerel—Spanish							472	472
Mullet		2,409	3,947	5,466	11,822			
Perch	1,733	30,350	218	2,970	71,788	260		260
Pike					147			
Pompano		307		219	569			
Rock Bass	1,859	90,565	63,750	51,625	207,799	567	130	697
Rockfish	10,311	291,661	3,848	178,448	1,547,996		524	524
Sablefish		1,044			491,807			
Salmon					3,980,109			
Sandabs		3,547			205,495			
Sardines		23,524	270	29,574	74,384,941			
Sculpin	17	22,378	493	38	22,926			
Sea Bass—Black	40	21,404	13,946	14,923	50,313	22,230	26,722	48,952
Sea Bass—White	40,631	438,133	3,530	201,538	747,504	60,783	163,489	224,272
Shad					3,356			
Shad—Buck					10			
Shad—Roe					10			
Sheepshead	167	50,132	626	3,088	54,013			

Skates		3,781	24		80,433			
Skipjack		765,421	2,778	1,855,004	2,623,203	1,267,273	3,840,836	5,108,109
Smelt	3,118	62,420	5,773	376	285,612		83	83
Sole	129,483	13,643	618	309	2,191,237			
Splittail					1,454			
Striped Bass					203,426			
Swordfish		130,473	240	239,569	370,282		1,234	1,234
Tomcod					9,261			
Tuna—Bluefin		10,683,835	58	25,051	10,708,944	2,165,818		2,165,818
Tuna—Yellowfin		12,529		22,635	35,164	6,291,746	18,779,950	25,071,696
Turbot					5,323			
Whitebait					29,289			
Whitefish	17	13,825	251	15,004	29,097	256		256
Yellowtail		147,349	4,876	646,895	799,120	1,340,778	559,553	1,900,331
Miscellaneous	177	31,226	975	471	70,743		1,838	1,838
Total fish	272,690	17,740,180	188,946	4,834,049	107,161,611	12,348,994	23,606,797	35,955,791
Crustaceans:								
Crabs					[1]92,520			
Shrimps					1,402,384			
Abalones	6,400				975,905			
Clams—Cockle		9,418			17,888			
Clams—Mixed					706			
Clams—Pismo	32,746				33,351			
Clams—Softshell					22,847			
Cuttlefish			30		22,900			
Oysters—Eastern					[2]97,196			
Oysters—Native					11,157			
Squid					1,523			
Miscellaneous:								
Terrapins					58			
Totals	311,836	17,749,598	188,976	4,834,049	109,843,646	12,348,994	23,606,797	35,955,791

[1] 3,855 dozen.
[2] 441,800 shell oysters.

STATEMENT OF EXPENDITURES

For the Period July 1, 1929, to June 30, 1930, of the Eighty-first Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Administration:					
Executive and legal	$16,820 00		$24 70	$15 40	$16,860 10
Clerical and office	18,283 90	$1,187 49	934 73	210 45	20,616 57
Printing		16,193 95			16,193 95
Automobiles		284 71	18 50		303 21
Traveling			4,884 55		4,884 55
Postage			4,591 51		4,591 51
Telephone and telegraph			4,732 23		4,732 23
Freight, cartage and express			2,206 20		2,206 20
Rent			15,328 61		15,328 61
Heat, light and power			305 59		305 59
Accident and death claims			5,234 25		5,234 25
Accounting pro rata	3,600 00				3,600 00
Legal			807 05	22 25	829 30
Publicity			362 18		362 18
Total administration	$38,703 90	$17,666 15	$39,430 10	$248 10	$96,048 25
Education and research:					
Chief and assistant	$7,761 94		$10 00	$6 46	$7,778 40
Clerical and office	1,292 00	$198 07	258 35	386 01	2,834 45
Traveling			3,828 26		3,828 26
Photographer	1,200 00		251 75	1,575 94	3,007 69
Librarian	1,920 00	97 82	59 29	371 34	2,448 45
Exhibits			40 00	75 00	115 00
Research	4,362 54	403 06		475 34	5,240 94
State fair	276 00	260 71	800 35		1,337 06
Lecturers	2,695 00				2,695 00
Printing		34 80			34 80
Freight, cartage and express			2 00		2 00
Blue printing			13 00		13 00
Publicity			100 93		100 93
Total education and research	$20,207 48	$994 46	$5,343 93	$2,890 09	$29,435 96
Publicity:					
Chief of Bureau	$1,650 00		$253 61		$1,903 61
Traveling			39 40		39 40
Total publicity	$1,650 00		$293 01		$1,943 01
Patrol and law enforcement:					
Chief and assistants	$12,095 00			$11 55	$12,106 55
Clerical and office	2,930 00	$160 81	$27 28		3,138 09
Automobiles		3,530 94	1,599 68	621 91	5,752 53
Traveling			141,218 97		141,218 97
Captains and deputies	$208,659 15	$929 35	$1,583 60	$748 00	$211,920 10
Fish planting	1,993 43	720 69	1,057 32	828 00	4,599 44
Watchman	60 00				60 00
Launches	2,040 00	1,269 16	619 42	965 00	4,893 58
Volunteer deputies	555 00	38 50	5 00		598 50
Premiums on bonds			4,843 41		4,843 41
Freight, cartage and express			4 77		4 77
Rent			417 91		417 91
Total patrol and law enforcement	$228,352 58	$8,649 45	$151,377 36	$3,174 46	$389,553 85
Commercial fisheries:					
Chief and assistants	$10,500 00			$7 47	$10,507 47
Clerical and office	8,976 89	$164 84	$62 09	34 45	9,238 27
Automobiles		386 85	89 12	506 02	901 99
Traveling			19,204 68		19,204 68
Research	6,529 83	8 25		302 70	6,840 76
Captains and deputies	15,058 03	165 50	34 57	117 34	15,375 44
Launches	5,674 47	3,494 42	3,204 25	277 76	12,650 90
Statistics	2,940 00	458 70			3,398 70
Laboratory	31,474 74	1,021 15	2,118 05	690 72	35,304 66
Fish tags		412 50			412 50
Botulism			15,000 00		15,000 00
Hydro-Biological Survey Monterey Bay			1,500 00		1,500 00
Inspectors	28,694 50				28,694 50
Temporary help	319 25				319 25
Postage			20 00		20 00
Freight, cartage and express			73 09		73 09
Heat, light and power			7 49		7 49
Total commercial fisheries	$110,167 71	$6,032 19	$41,313 34	$1,936 46	$159,449 70

STATEMENT OF EXPENDITURES—Continued

For the Period July 1, 1929, to June 30, 1930, of the Eighty-first Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Fish culture:					
Chief and assistants	$6,600 00				$6,600 00
Clerical and office	3,900 00	$65 82	$14 00	$5 05	$3,982 87
Automobiles		4,664 03	2,078 30	1,771 31	8,513 64
Traveling			13,445 51		13,445 51
Telephone and telegraph			850 82		850 82
Rent			1,152 85		1,152 85
Heat, light and power			905 70		905 70
Hatcheries	131,937 83	67,305 32	2,498 20	2,717 20	204,458 55
Hatcheries—additions and betterments				17,976 18	17,976 18
Special field investigations	11,758 00	61 61	233 08		12,052 69
Fish cars		262 78	2,304 79		2,567 57
Freight, cartage and express			1,429 53		1,429 53
Blue printing			17 00		17 00
Total fish culture	$154,195 83	$72,359 56	$24,929 78	$22,467 74	$273,952 91
Hydraulics:					
Chief and assistants	$6,060 00		$18 37		$6,078 37
Clerical and office		$51 78	28 73		80 51
Automobiles		498 70	146 40		645 10
Traveling			1,453 37		1,453 37
Cooperative research	2,459 55	2 10	38 25		2,500 00
Blue printing			30 93		30 93
Total hydraulics	$8,519 65	$552 58	$1,716 05		$10,788 28
Game propagation:					
Superintendents	$4,914 17				$4,914 17
Automobiles		$325 12	$48 49	$1,986 01	2,359 62
Traveling			2,269 98		2,269 98
Heat, light and power			787 65		787 65
Laborers	8,476 54				8,476 54
Maintenance		10,391 41	1,663 44	4,397 28	16,452 13
Telephone and telegraph			151 55		151 55
Freight, cartage and express			141 71		141 71
Total game propagation	$13,390 71	$10,716 53	$5,062 82	$6,383 29	$35,553 55
Fish rescue:					
Chief and assistants	$4,669 00	$3 69	$127 60	$4 10	$4,804 39
Traveling			1,867 48		1,867 48
Rent			129 00		129 00
Heat, light, water and power			9 00		9 00
Total fish rescue	$4,669 00	$3 69	$2,133 08	$4 10	$6,809 87
Game refuge:					
Chief and assistants	$4,000 00				$4,000 00
Clerical and office	1,800 00	$5 27	$1 25		1,806 52
Automobiles		511 47	307 62		819 09
Traveling			1,305 22		1,305 22
Lion hunters and trappers	7,661 79				7,661 79
Refuge posting	2,962 71	73 33	49 92		3,985 96
Game refuge supplies		177 92	44 37		222 29
Lion bounties			6,710 00		6,710 00
Total game refuge	$16,424 50	$767 99	$8,418 38		$25,610 87

STATEMENT OF EXPENDITURES—Continued

For the Period July 1, 1929, to June 30, 1930, of the Eighty-first Fiscal Year

Function	Service and expense	Total
License commissions	$49,961 41	$49,961 41
Purchase of game refuges		4,558 98
Purchase of Hungarian partridges		4,759 73
Construction of Russian River jetties		17,750 00
Expenditures to pay claims for returns of fish and game licenses		83 50
Expenditure to pay claim of Harry L. Hopper		658 50
Prior year		192,988 70
Grand totals	$49,961 41	$1,299,906 87

STATEMENT OF INCOME

For the Period July 1, 1929, to June 30, 1929, of the Eighty-first Fiscal Year

License sales	Detail	Total
Angling, 1929	$395,537 95	
Angling, 1930	79,671 90	
Commercial hunting club licenses, 1929-30	2,550 00	
Commercial hunting club operators' licenses, 1929-30	820 00	
Deer tag licenses, 1929	115,471 80	
Fish breeders' licenses, 1929	75 00	
Fish breeders' licenses, 1930	425 00	
Fish importers' licenses, 1929	55 00	
Fish importers' licenses, 1930	95 00	
Game breeders' licenses, 1929	195 00	
Game breeders' licenses, 1930	827 50	
Hunting licenses, 1929	447,723 87	
Hunting licenses, 1930	24,213 90	
Kelp licenses, 1929	10 00	
Kelp licenses, 1930	50 00	
Market fishermen's licenses, 1929-30	29,170 00	
Market fishermen's licenses, 1930-31	32,110 00	
Trapping licenses, 1929-30	4,438 00	
Wholesale fish packers' and shell fish dealers' licenses, 1929-30	1,320 00	
Wholesale fish packers' and shell fish dealers' licenses, 1928-29	20 00	
Total license sales		$1,134,689 92
Other income:		
Game tag sales	$51 69	
Court fines	84,872 40	
Fish packers' tax	202,596 07	
Kelp tax	105 97	
Fish tag sales	3,398 84	
Miscellaneous sales	1,027 12	
Interest on bank balances	5,191 20	
Total other income		297,043 29
Total departmental income		$1,431,733 21

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

VOLUME 17 SACRAMENTO, APRIL, 1931 No. 2

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FIELD TRIALS IN CALIFORNIA

By H. L. BETTEN

FIELD TRIALS for pointers and setters had their inception in England in the early seventies. The first competitive trials in America were held at Memphis, Tennessee, in 1874. In California the inaugural trials date back to 1881 and were run at Gilroy under the auspices of the Gilroy Rod and Gun Club.

As originally instituted, this competitive sport aimed at the improvement of the hunting breeds through the selection of individuals best qualified to enhance the abilities of setters and pointers. Of course selections were taken from the most prominent dogs. The plan worked in much the same manner as the racing of standard bred and thoroughbred horses and tended to improve the gaited and running stock.



FIG. 40. Great sport in early days. Field trial dogs, Cuba Jr. (pointer), and Sports Destiny (setter), engaged in keen competition. Photograph by W. W. Richards at Bakersfield in 1906.

To realize thoroughly the aims and objects of the projectors of field trial competition it is necessary to consider the status of dog breeding and of upland shooting in the British Isles during the last half of the nineteenth century. During this period it was the general custom for sportsmen to kill most of their upland game birds over the points of setter or pointers or else before close ranging spaniels that gave tongue before flushing the birds. In either instance the shooter was forewarned as to the proximity of the game. However, about the close of this period in history the owners of large estates became desirous of speedier shooting and larger bags and introduced the system of batteau shooting and the driving of game; this is the system now mainly in vogue in Europe and elsewhere.

American sportsmen, intent on securing the best hunting blood obtainable, turned early to the British for outstanding breeding stock. Pointers and setters in particular were favored and during the period

from 1870 until 1885, and even later, numberless importations were recorded from the best kennels in the British Isles. During this period a system for accurate registration of breeding was installed in America and abroad. As a result dog fanciers started to take pride in the authenticity of breeding and in illustrious ancestry and no expense was spared in purchasing the finest individuals of both breeds. Concurrently, spaniels and other types of sporting dogs became quite popular and assumed an importance at the various shows.

Because of the splendid upland shooting, the early Californians imported many fine dogs into the State. From about 1870 until 1880, Laverack and Irish setters, English pointers and working spaniels were greatly favored. Thereafter the so-called Llewellyn setter, an English setter strain, rose in popularity because of outstanding field qualities.

During these early years the Gilroy Rod and Gun Club held annual trials. However, in 1883 the Pacific Coast Field Trial Club, organized in Sacramento, entered the field and held yearly competitions. These trials were held uninterruptedly until the year 1923 when the steady and alarming diminution of valley quail and the inability to find suitable training and trial grounds led to a dissolution. Since then trials have been held sporadically in the south but remain relatively unimportant.



FIG. 41. Efforts were made to obtain the best hunting blood possible. Here we see J. E. Terry's fine setter, Ladylike. Photograph by H. L. Betten at Bakersfield in 1906.

It might be well to add that these trials were held in various parts of the State, namely: Gilroy, Walltown Timber, Point Reyes, Hanford, Salinas, Coronado, Santa Maria and other localities. The history of this competitive sport is interwoven mainly with the city of Bakersfield in which vicinity most of the outstanding trials were held.

In judicial connections it was the practice of the Pacific Coast Field Trial Club to secure the best judging talent in America. Competitions

were judged by what is known as the spotting system. Dogs were drawn to run in pairs. Out of the total number competing in the first series the judges selected those individuals which in their estimation measured highest in speed, range, endurance, nose or scenting ability, style, bird sense and other natural qualities essential in a high class performer. Staunchness, tractability and other acquisitions, the result of training, were also taken into consideration. Eventually, after a process of elimination, the three outstanding dogs in a stake were selected as winners.

In the final analysis, aside from the pleasures of clean competitive sport, field trials have served a very useful purpose on this continent. By stirring up an active rivalry among sportsmen these contests have led not only to importation of the very best blood but of the acquisition



Fig. 42. Competitions were judged by the best available talent in America. Scenes like this were common in the real days of the sport. Photograph by H. L. Betten at Bakersfield in 1908.

of the highest class performers through which to perpetuate the inherent characteristics and qualities of sporting breeds. While it is true that like does not inevitably or regularly beget like, the prepotency of certain outstanding individuals in any established breed is a well known fact. And the selection of such high grade individuals as the best medium through which to improve stock is the system followed by most successful breeders. The possession of blue blood alone is not sufficient to guarantee against mediocrity; there must be a sound background of ability and merit to insure advancement or to maintain a satisfactory level because all animals that are bred under artificial conditions are inclined strongly toward deterioration.

Although the average field trial contestant generally requires to be toned down for ordinary field shooting, it is a fact that many of the

greatest shooting dogs ever owned in this State originally were developed for field trial competition. And in numberless other instances these deseended directly from field trial winners and other competitors in trials.

Within the past forty years California produced not only a considerable number of superlative performers in competition east and



FIG. 43. Men who made history in California field trials. Left to right are E. Courtney Ford, Fred Tegeler and Hon. C. N. Post. Photograph by H. L. Betten at Bakersfield in 1911.

west, but a very large number of splendid shooting dogs. Among the winning pointers of note, I call to mind, were Lemmie B., Tom Pinch, Climax Lassie, Old Black Joe, Sankey, Patti Croxteth T., Old Black Joe II, Sally Brass II, Doris, Glenbeigh, Glenbeigh Jr., Alec C., Cuba of Kenwood, Sam's Bow, Senator P., Nellie Wilson, Cuba Jr., Dr. Daniels, Pearl's Jingle, Colton, Petronella and Spot's Rip Rap.

In the list of outstanding setters were Sweetheart, Sunlit, Sirius, Leo R. Herold, Countess Noble, Starlight, Pelham, Betsy Mark, Nimrod, Mercury, Peach Mark, Orion, Valiente, Dash Antonio, Gleam's Ruth, Donna Alicia, Merry Heart, Peach Blossom, Lady, Northern Huntress, Kilgarif, McCloud Boy, Ladylike, Mariposa, Policy Girl, Tiburon, Shasta Daisy, Old Forester, Melrose Mack, St. Ives, Clipper W., Melrose Dude, Light, Shasta Queen, Kil's Viola, Kenwood Maid and Kenwood Boy.

During the heyday of trials and crest of upland shooting in California a considerable number of professional trainers served both field trial patrons and owners of shooting dogs. Others catered merely to those who desired dogs trained solely for shooting. As a matter of fact in either instance breaking was conducted essentially along similar lines although in connection with field trials the dogs were keyed up to



FIG. 44. What sport could attract keener interest than that involving well bred dogs? Above are a few field trial patrons gathered at Del Monte. Photograph taken in front of Hotel Del Monte by H. L. Betten in 1914.

a high pitch; this emphasized and exalted the natural qualities to a very great extent and showed them to best possible advantage.

Among professional trainers prominent in this State were George Allender, M. D. Walters, Wm. De Mott, W. B. Coutts and his sons, Charles and Fred, J. E. Lucas, R. M. Dodge and C. H. Babcock. Several of those named competed in eastern trials with excellent success, notably Babcock, who piloted Manitoba Rap and John Proctor to victories in the national championship and scored wins with other dogs on numberless occasions.

In considering the influences which inducted into the State and brought to the fore superior specimens of the hunting breeds, a tribute must be paid to the unfailing interest and great beneficial influences of the late Hon. C. N. Post, of Sacramento. Not only was he the organizer and consistently active supporter of field trials in California

for more than thirty years, but his individual importations and rare judgment in the selection and development of high grade stock brought the English setter to that grade of perfection in this State where the excellence of the breed was generally recognized by sportsmen.

Under prevailing conditions upland shooting in California has degenerated to a very material extent. It is now the rule rather than the exception for the shooter, unassisted by a well trained dog, to aim at the limit; his mind obsessed with the desire for slaughter. Ordinarily he is armed with a twelve-gauge pump gun or automatic and the finer possibilities of upland shooting, the essence of the sport, are lost to him. But ask any veteran sportsman who has experienced the pleasures of shooting over the rigid points of a well trained dog, just what constitutes the acme of sport in hunting valley quail or any other upland game that lies closely. Without hesitation he will declare that the greatest attraction and thrill lies not in the actual shooting but in the clever work and the statuesque postures of his four-footed companion.

Perhaps the time will come again when the finer ethics of sportsmanship will be revived; when sportsmen of California will cease to take game fish with salmon roe and one of the finest of upland game birds, the valley quail, will be hunted as it should be, over the points of a good dog and not tramped out of cover by a line of beaters and hammered to earth by a machine gun barrage. Should this renascence develop it is reasonable to expect that good field dogs will again be numerous in the land and that field trial competition will flourish anew.

While it would be impossible in the scope of this article to name the various sportsmen who from time to time have been interested in the advancement of the field dog in this State it is pertinent to mention an outstanding list of consistently active fanciers, namely: E. Leavesley, J. M. Bassford, Jr., Hon. C. N. Post, P. E. G. Anzar, Wm. Schreiber, J. G. Edwards, J. M. Barney, E. W. Briggs, W. Dormer, Jas. E. Wattson, Jos. E. Terry, T. J. Wattson, A. B. Truman, J. F. Hughes, P. D. Linville, W. G. Kerckhoff, H. W. Keller, H. T. Payne, R. K. Gardiner, J. H. Schumacher, H. Vernon, J. M. Kilgarif, Maj. S. Christensen, W. B. Coutts, W. W. Van Arsdale, Dr. C. E. Wilson, F. J. Ruhstaller, W. S. Tevis, T. J. A. Tiedemann, R. M. Dodge, J. W. Flynn, Albert Betz, Jos. Chanslor, J. E. Lucas, Fred Butler, A. G. Wilkes, Phil Wand, J. W. Considine, Dr. Arthur Beardslee, J. H. Bishop, Jr., and J. Walter Scott.

To this list should be added the name of Mrs. Phoebe Hearst, whose importations of superior setters, notably Champion Count Gladstone IV, added much to the quality of our field dogs. In fact, it is almost impossible to find a well bred setter today which does not trace back to that great field champion.

"ALBACORE" IN THIRTEENTH YEAR*

By John Terry

ON JANUARY 22, 1931, anniversary of her trial run, the *Albacore* will round out thirteen years of duty. For thirteen years she has cruised California coastal water from the Mexican line to Trinidad Head, steadily carrying on the diversified work that has made her name familiar to commercial fishermen and marine scientists throughout the State.

In both these fields—commercial fisheries and research—she has played a not undistinguished role. Her construction made possible the

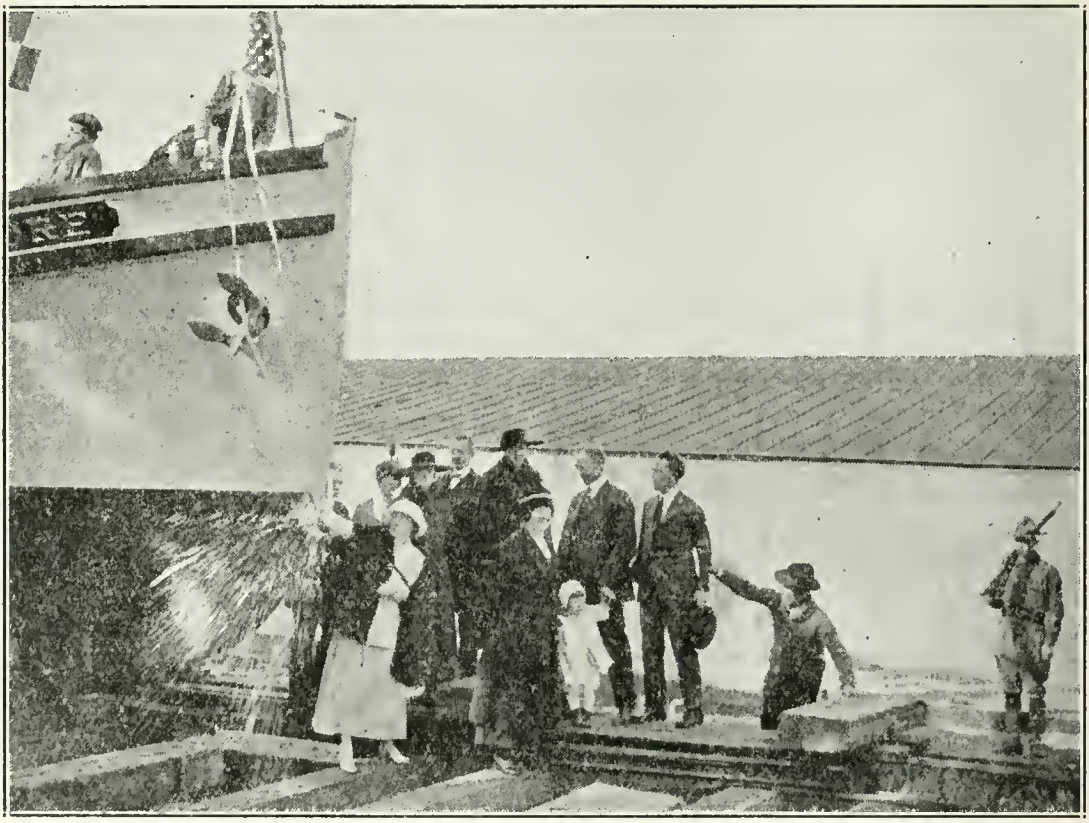


Fig. 45. Christening of the powerful ocean-going patrol boat *Albacore* at Wilmington in December, 1917. To Mrs. Edward A. McKee, whose husband at that time headed the Los Angeles office of the Division, fell the honor of crashing a five dollar bottle of California champagne over the bow of the boat. The soldier at the left reminds one of the wartime period. Photograph submitted by N. B. Scofield, January, 1918.

first consistent effort towards California fisheries conservation and enforcement through off-shore patrol, and instituted for the first time in these waters a program of research applied to problems affecting a rich and growing industry. Whatever may be the future development in either of these fields, the *Albacore* will be accorded distinction for pioneer efforts.

It was the urgent need for such pioneering that induced the construction of the vessel. California's prodigious commercial fisheries

* Reprinted from *The West Coast Fisheries*, January, 1931, pp. 45, 47, 49, 51.

growth dates back to the opening years of the war, when unprecedented demand for foodstuffs multiplied the fishing effort, skyrocketed tuna and sardine catches and launched construction of the first big canning plants in California fishing ports.

N. B. Scofield, head of the Commercial Fisheries Bureau, and H. B. Nidever, supervising patrol captain, at once recognized the need for a more rigorous marine patrol than had existed theretofore, both in protection of a State-owned natural resource and for the ultimate welfare of the commercial interests themselves.

As early as 1914–1915, Nidever had been making periodic inspection trips into southern California from his San Francisco office. In the absence of state-owned craft, he was obliged, at a cost of $60 a day, to charter private boats for his occasional patrol cruises. In every way this was an inept system, costly and subject to the availability of boats and the whims of their owners.

Occasionally Fish and Game deputies, working in chartered craft, overhauled fishermen at sea, to require exhibition of licenses. But in the main little was accomplished. Then, suddenly, war conditions arrived, and canneries sprang into being to send a new California product into a world market.

Nidever, with the support of Scofield, soon began drawing plans for a State-owned patrol craft. To this task he brought a fund of appliable experience.

Before joining the Division of Fish and Game he had served in both the merchant service and the U. S. Navy, where he had charge of repairs on steam launches. With this thorough understanding of his subject, he set about drafting plans late in 1915. A delay in appropriations allowed a full year to pass uneventfully. Nidever redrew his specifications and outlined construction requirements more completely. During this time he had the assistance of Harry Carlson.

After a naval architect had put Nidever's plans on blue prints for figuring, the Fulton Shipbuilding Company of Wilmington, low bidder, was awarded the contract for the hull. At that time, Carl Westerfeld, commodore of the Corinthian Yacht Club, and an enthusiastic champion of a new fish and game patrol boat, held the post of executive officer of the Division. During his term in office—in August, 1927—construction began.

Building the Ship.

Nidever, who supervised construction, soon discovered that he had a real task on his hands. In those days of plentiful jobs and magnificent wages, workmen had a habit of coming and going pretty much as they fancied.

"We had a queer lot working on the *Albacore*," Nidever says, reminiscently. "House carpenters, cabinet makers—anybody, and I was always busy trying to keep enough men on the job."

A 65-horsepower Acme distillate engine was ordered and, after a thorough dock trial, was installed. Originally planned to cost $14,000, the addition of extra equipment after launching ran the bill up to $18,000. The trial trip started late in the afternoon of January 22, 1918, when the vessel left the Wilmington yards for Catalina Island with Captain Nidever at the wheel. M. J. Saunders, engineer, and

Jack Riekman, cook and deekhand, completed the erew. George Bonds of the Aeme company handled the engine on the test cruise.

Over a $6\frac{3}{4}$-mile course the following day the *Albacore* went out in 47 minutes and back in 44. A day later she negotiated the full $13\frac{1}{2}$ nautical miles in 86 minutes, logging 9 knots with the engine turning as high as 370 revolutions per minute.

Like many another vessel built before the time of heavy-oil engines, the history of the *Albacore* falls into two divisions that might be deserибed as her "distillate" and "diesel" epochs. Considerations of safety and eeonomy led to substitution of a 60-horsepower semidiesel plant in May, 1926, for the Aeme gas engine that had given yeoman service sinee its installation eight years previously. No one was more pleased with the new plant than the engineer, M. M. Triteh, now resident in Long Beach.

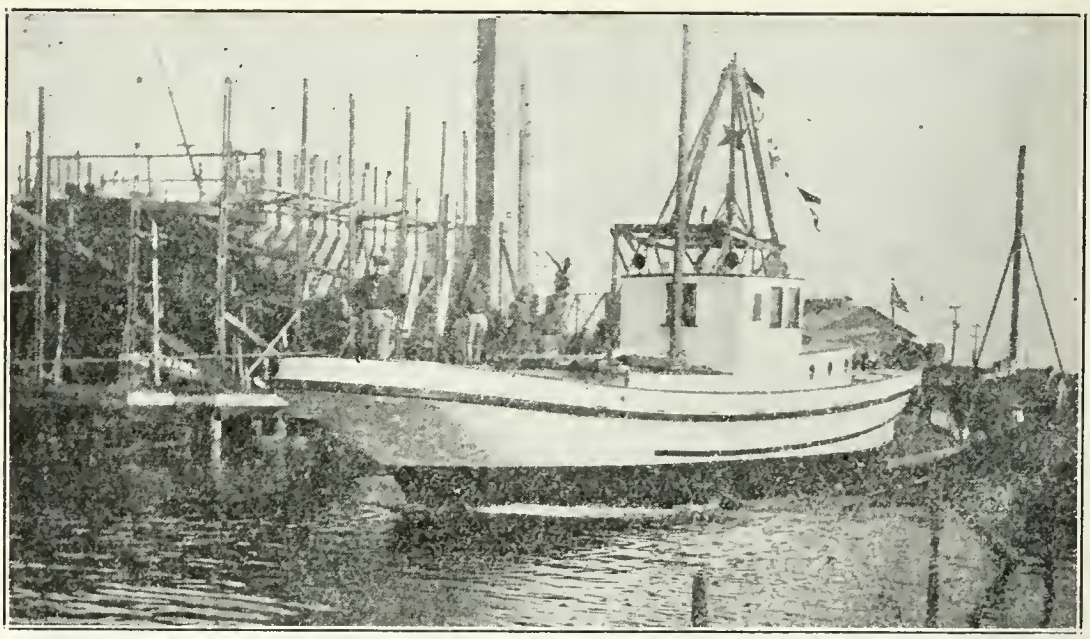


Fig. 46. Patrol boat *Albacore* sliding down the ways at Wilmington in December, 1917. Photograph submitted by N. B. Scofield, January, 1918.

Gasoline Fire Hazard.

Prior to her diesel days, life aboard the *Albacore* often was made exeiting by the threat of fire. Perhaps the nearest approaeh to annihilation oeeurred on the night of Deeember 8, 1921, when Nidever and Patrol Captain Harry Groat had taken the vessel to the aid of a fishing craft that had gone ashore during fog that afternoon. The disabled boat was the *Nueva Riva* owned by S. Carmen of San Pedro.

After a line had been put aboard the beaehed craft, the *Albacore* exerted a strain, Nidever handling the pilot house controls. Groat deserибes the incident:

"We still were pulling when I happened to look below. The whole engine room was on fire. We dropped the hook and went to work, closing everything tight, stuffing blankets in the portholes and shutting down the hatches—all the time wondering when the 1000-gallon tank of distillate alongside the engine was going to blow us elear out of the water. We then unlimbered a big ehemieal extinguisher and a battery of smaller Pyrenes.

"Well, we got the fire out after half an hour's work, and it took our last Pyrene to turn the trick. For some reason that distillate wouldn't blow up.

"When we went below we found the woodwork badly charred and all the wires burned off the engine. That made two disabled boats at Brighton Beach where there had only been one thirty minutes before.

"That night we managed to make repairs. Next morning we got another line on the *Nueva Riva* and yanked her off. It was the previous yanking, by the way, that caused the trouble. Hot clutch."

Gasoline Explosion.

Shortly before changing to diesel power, an explosion below decks spread momentary consternation among the crew.

"We were running at night off Anacapa Island," reports Norman Kunkel, patrol deputy, who was aboard. "Walter Engelke, who was skipper then, was at the wheel, and I was there with him. A couple of other chaps were asleep below. Suddenly something blew up. Sounded like a dreadnaught's broadside, only there wasn't anything in that corner of the world but Anacapa Island, water, and us—and we didn't know how much longer we were going to stay.

"We slammed everything down tight over the engine room, got our skiff overboard so we wouldn't have to swim, and then waited, expecting fire to break out any minute. But nothing happened.

"When we finally went below we found that a plate on the crankcase base had blown off like shrapnel. One piece of metal as big as my fist was buried in a four-by-four timber. Accumulation of gas in the crank case, so they said, started the trouble. If anybody had been in the engine room when she blew up there would have been a funeral in the Fish and Game Commission."

Repairs were effected, and the *Albacore* continued at her work.

The Gasoline Stove Risk.

Before one of the Shipmante ranges was installed in the boat several years ago, and supplied with "bottle gas," the galley was another breeding ground for mischief. At odd times the gasoline stove would go up in fire and smoke like Vesuvius, driving the cook to the verge of lunacy and threatening the whole boat with destruction. It was a condition that Harry Groat once summarized in these words:

"Every time the cook went into the galley to light the stove he carried a box of matches in one hand and a fire extinguisher in the other."

Repeated eruptions of the gasoline stove soon made it necessary to line the galley with sheet metal, until the place begun to resemble quarters aboard an armored cruiser. Nearby hung the everready Pyrene.

Through a combination of luck and vigilance the *Albacore* passed through her distillate-engine and gasoline-stove days relatively unscathed. Thereafter—when the volatile-fuel motor and the incendiary galley wear had been replaced by a "bottled-gas" range and a diesel—fires became a thing of the past. Ernest Schmidt, cook at the time when the range was installed, proclaims it as a special boon;

"It removed the constant scare and fire hazard," he explains, "and did away with the odor that pervaded the whole boat when we were using gasoline stoves. It gave a steady flame at all times. The flame from the gas stoves, of course, would rise and fall with the motion of the ship as the fuel splashed about. After they gave me the range I didn't have to fight fire any more; before that, being the cook was a hero's job!"

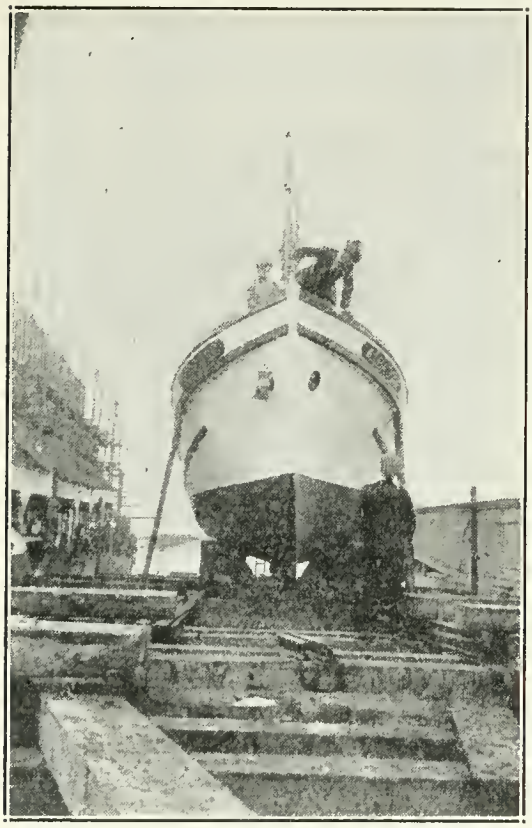


FIG. 47. The *Albacore* in drydock for a complete overhauling. Photograph submitted by N. B. Scofield.

Completely Overhauled.

Semiannually the patrol boat has been drydocked for overhauling. In June of 1930 she was given her most thorough overhauling preparatory to changing base port to Monterey. On the ways, with Harry Groat supervising the work, a month was spent making the ship as fit as the day she was commissioned. She was redocked, reenameled and rerigged. Her engine and combustion system were overhauled. New stern bearings were installed. Her lighting system came in for overhauling. The double-gypsy salmon troll winch received similar attention. Finally, the vessel was repainted both inside and out.

Buoyancy by Bailing.

Constant good care, supplementary to correct original design and sound construction, have enabled the *Albacore* to prove herself particularly staunch. In thirteen years of steady operation she has withstood much heavy weather. Her most trying experience occurred May 1, 1929, while making the passage from San Francisco to Eureka. Outside Golden Gate a northwest wind was encountered, the velocity of which was estimated by Captain Engelke to be 50 miles an hour. Acording to Milton Lindner, ship's biologist, seas began breaking aboard, and from time to time water went down the stack.

"After an hour of this," Lindner relates, "The engineer came on deck with the gratifying news that the engine bilge pumps wouldn't work, that the hand pump was broken, and couldn't someone, dammit, give him a hand? The only thing left was a little syringe-like contraption on the order of a bicycle pump. Being the scientist on the cruise, I was delegated below to relieve the engineer, who half expected to see the hull split and the Pacific ocean surge up through the middle.

"When we made Point Reyes at seven o'clock that night and anchored in Drake's Bay there was six inches of water in the galley. Captain Engelke, Engineer Greenleaf and I were bailing with buckets by that time. The cook kept complaining that pans on the port shelf were jumping across the galley and landing on the starboard shelf."

Life Saving Duty.

"At 11 o'clock that night a life-saving crew from the Point Reyes station rowed alongside in a dory. Their power launch had just been painted, so could not be used, and they wanted us to take them out to the Alaska Packers' ship *Kadiak* reported sinking 10 miles west of Point Reyes. The *Albacore* which has quarters for six men, resembled a sardine factory, with eight lifesavers, and four of us aboard and two more oarsmen in the dory, which we towed toward the Farralon Islands."

The *Albacore*, according to crew reports, described every letter of the Turkish alphabet as she wallowed towards the disabled *Kadiak*. Lindner vows that every time he peered fearfully over the patrol boat's rail he could see her keel.



FIG. 48. Besides the regular patrol duty, the *Albacore* has made an enviable record in life saving service. The fine boat is pictured above plowing along on the high seas on an errand of mysterious nature. Photograph submitted by N. B. Scofield.

Only the shrieking of the gale drowned out the groans of the lifesavers, who, poor fellows, were suffering from illness. To make matters worse, the dory astern learned the trick of surfboarding. For a moment it would hang dizzily on the crest of a wave, then tear down with express speed, threatening to board the *Albacore* by the quarter. Only the skill of the able helmsman in the dory held off disaster.

Meanwhile a San Francisco tug had put a line aboard the *Kadiak* and had started towards San Francisco with her. The *Albacore* then put about to fight back to anchorage. To borrow once again from Lindner's account, she seemed to carry three waves on her deck at all times—one forward, one amidships and one aft.

Six and a half days after departure from San Francisco, the Commercial Fisheries vessel crossed Eureka Bar—a run that normally

required two days. But despite the weather, she had hove to on three occasions during the trip while Lindner made experimental net hauls in an effort to accumulate scientific data.

Samaritan Afloat.

The *Kadiak* and *Nueva Riva* affairs are but two incidents in a long series. The patrol boat has assisted or salvaged many disabled or stranded craft of all sizes. Not infrequently she has succeeded in effecting temporary repairs, making it possible for them to continue on their way.

"I imagine," Captain Nidever has said, "that the combined value of boats we have saved represents several times the original cost of the *Albacore*.

On the 18th of April, 1918, when the patrol boat was less than three months off the ways, distress signals of a steamer were heard off Point Vincente. Nidever tells the story: "We were running north along the coast. On hearing the whistle, we approached slowly through a pall of fog that shut out land and sun. Suddenly a wall of white rose up before us. At first we thought it was the *Harvard* or *Yale* that lay there grounded off the Point.

The ship turned out to be the *Phyllis,* a 215-foot lumber-carrier, built only the year before in Aberdeen, Washington, and owned by W. R. Chamberlin of Seattle. The *Albacore* carried the steamer's anchor into deep water, dropping it there. This purchase kept the *Phyllis* from moving shoreward with the swell. In engineering this somewhat dangerous feat, the Commercial Fisheries vessel damaged her stern when thrown against the steamer's bow by a breaking sea.

Taking the captain of the *Phyllis* aboard, the *Albacore* returned to San Pedro, picked up 25 stevedores and carried them back to jettison the deck-load of lumber. Presently another cargo vessel arrived to haul the *Phyllis* into deep water.

Other Services.

Old patrol logs attest to additional instances where aid was given disabled vessels:

October 1, 1918. Went to the aid of a West Coast tuna barge grounded on the San Pedro Breakwater. The *Albacore* also grounded, and before she could be floated another vessel dragged the buy-scow into deep water.

September 10, 1921. The lampara boat, *Tortuga*, a 40-foot distillate craft owned by J. R. Parker of San Diego and valued at $2,000, was pulled off the beach near her home port.

December 14, 1925. The *Lucky Girl*, a new 42-footer, owned by Roko Grubelich, was towed eight miles into San Pedro in a disabled condition.

October 6, 1926. The *Kii Maru,* 46-foot fishing boat owned by T. Kagimoto of San Diego, valued at $3,000 and carrying a $1,500 net, was found disabled at sea and towed into home port.

February 28, 1927. The 111-foot tuna tender, *Hestin,* owned by John Hestin of Los Angeles, was found disabled 11 miles southeast of the San Pedro breakwater and towed in.

March 9, 1927. The $18,000 purse-seiner, *Sunlight,* owned by the Coast Fishing Company, was found grounded on Catalina Island in a water-logged condition. She had 42 tons of sardines aboard. To pre-

vent her sinking, the *Albacore* stood by all night. Avalon fishing boats arrived the next morning to pull her off. She had a $3,000 net aboard.

August 11, 1927. The *Bertha,* owned by F. D. Robertson of Newport Beach, valued at $2,500 and carrying a $2,000 net, was found beached at the east end of Catalina Island. The *Albacore* carried a line to her through the surf and pulled her off.

August 9, 1927. Went to the aid of the disabled *Pakinoa.*

January 25, 1928. The $5,000 boat, *Orient,* owned by S. Hayashi of Wilmington, carrying an $850 net, was found disabled off Santa Cruz Island with her batteries dead and her air and water tanks empty—a condition that had prevailed for five days. With the help of the *Albacore* and with a fresh supply of water, the *Orient* was started on her way. Six hundred pounds of rock cod on ice in her hold were still in good condition.

March 15 to 22, 1928. At the request of public officials the *Albacore* patrolled the Ventura coast off the mouth of the Santa Clara River, searching for bodies that might have been washed out to sea following the terrible flood that was occasioned by the bursting of the Mulholland Dam.

A Mission of Education.

The foregoing account makes no mention of the occasions on which the *Albacore* started to the aid of boats which, as matters turned out, received help from sources more immediately available.

In aiding vessels in distress, fishing craft particularly, the *Albacore* has been the instrument in carrying out a fixed policy of the California Commercial Fisheries Bureau. While insisting on enforcement of State fisheries law, the Bureau has sought to cooperate with the fishermen, especially through issuing warnings to potential offenders and by explaining the laws to those ignorant of statutory provisions. A mere desire to "make cases"—to hale offenders into court on petty technicalities—has been avoided in favor of the more generous and constructive policy of enlisting fishermen themselves in the constant battle against depletion of the fishery resource. This threefold program of assistance, education and enforcement has yielded results which, viewed in perspective, have been gratifying.

During thirteen years of patrol, the *Albacore* has been an effective instrument in aiding, teaching and enforcing. She has convoyed operations of various floating reduction plants. In the San Diego, San Pedro, Monterey and San Francisco fishing areas, and occasionally as far north as the Eureka grounds, she has patrolled against undersized and out-of-season catches, against illegal fishing methods—in short, against all those proscribed practices which endanger the future of California's commercial fisheries.

Contributions to Science.

There remains, to conclude, one other field in which the *Albacore* has proved indispensible—the field of commercial fisheries research. While such investigations have been carried on in the Atlantic and particularly in the North Sea since 1840, the West Coast has remained virtually untouched. This was pointed out in the April, 1919, issue of the

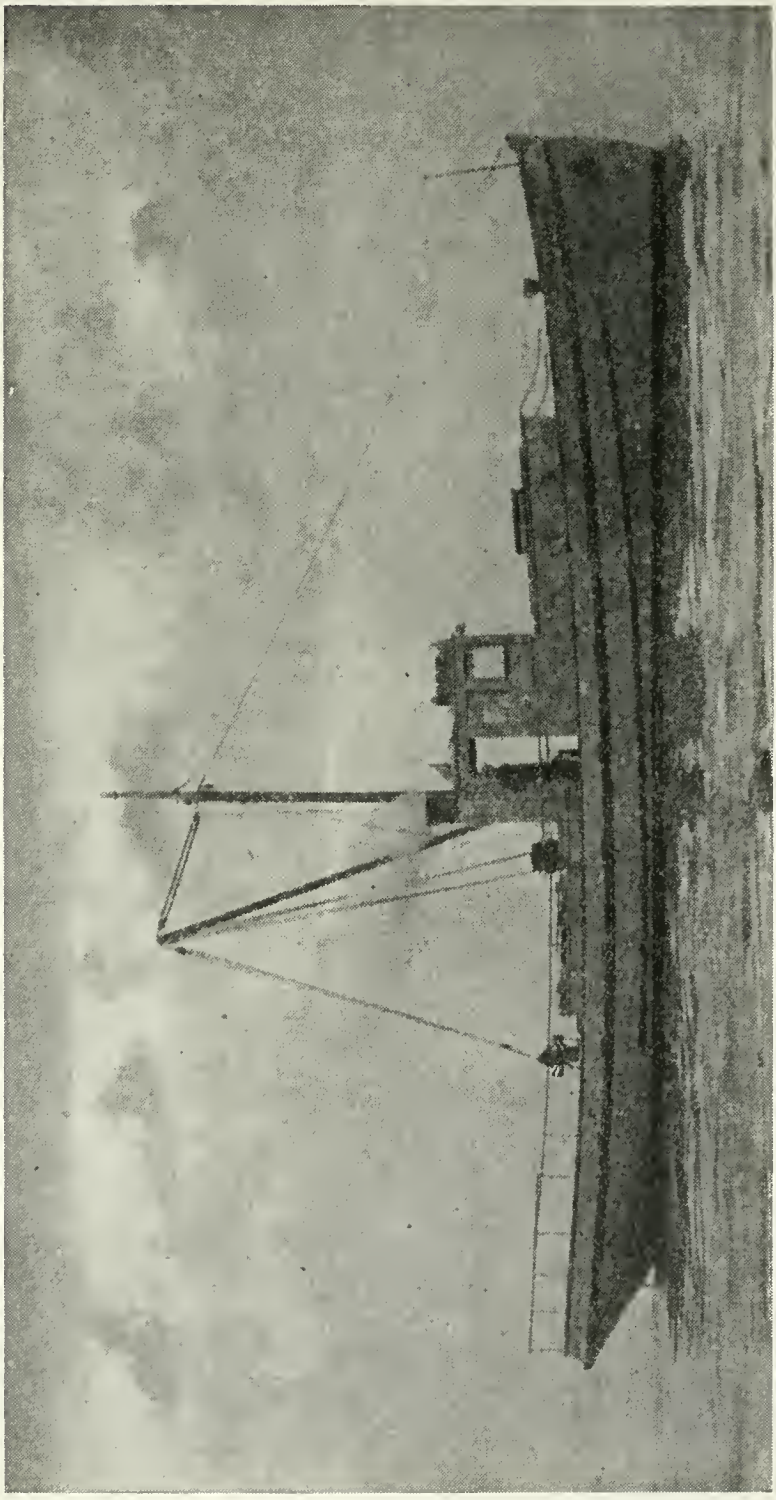


FIG. 49. The *Albacore* is used from time to time to make flora and fauna studies along the California coast. Here she is lying off the coast near San Clemente Island. Photograph submitted by N. B. Scofield.

California Fish and Game magazine, under the title, "The Scientific Work of the Boat Albacore." Aside from very limited studies that had been carried on aboard the U. S. Bureau of Fisheries research craft, *Albatross,* no special efforts had ever been made in California waters in the all-important study of the egg and larval stages of commercial fish—nor, for that matter, in the study of adult fish.

It was into this virgin field that the *Albacore* was directed, in addition to patrol activities. In the past two summers, E. C. Scofield of the California State Fisheries Laboratory has taken over the egg and larval studies for the sardine, and already has succeeded in finding sardine spawn over a wide area extending from southern California to Monterey. A parallel investigation was that undertaken by Milton Lindner, who commenced the study of certain phases of the life history of the West Coast mackerel, gathering his data from the decks of the *Albacore.*

Technological Studies.

From time to time experiments with new fishing gear have been tried aboard the *Albacore,* notably in 1918 when San Pedro canners brought H. Fukuno and T. Taniguchi from the Royal Japanese Fisheries School of Tokyo to this country to test the long-line method used in the Japanese bonito fisheries. After a thorough trial aboard the *Albacore,* the Japanese experts found the long-line unsuited to California albacore fishing because of slow prevailing currents.

Dr. B. W. Evermann of the California Academy of Sciences and various collectors of the Steinhart Aquarium of Golden Gate Park, San Francisco, also have used the *Albacore* from time to time, the former in studying flora and fauna of the channel islands and the latter in gathering fish specimens. It was aboard the same vessel that Paul Bonnot took the first census of California seals and sea lions.

A discovery of more than usual importance was made early in the craft's history when larvae of the spiny lobster was found from 50 to 150 miles offshore. Up to that time there had prevailed a belief that the spiny lobster was localized; thereafter it seemed probable that an interdependence exists between widely separated regions inhabited by the spiny lobster. In other words, the discovery indicated that lobsters migrate, and that the Mexican crustaceans could move to California and the California lobster to Mexico.

Still in Service.

If the preceding account has succeeded in summarizing the work of the *Albacore* during thirteen years of service—of assistance to disabled craft, of research and of an enlightened program of patrol—it may, at the same time afford an index to her work in the future.

Now that Captain Engelke has been transferred to the Commercial Fisheries newer vessel, the *Bluefin,* Lars Weseth is master of the veteran *Albacore.* The boat approaches her thirteenth birthday under his command as trim and staunch as on that January afternoon in 1918 when Captain Nidever tried her out on the 6¾-mile course off Santa Catalina Island.

TROUTING

By Earl R. Kauffman, Editor Pacific Sportsman, San Francisco, California

"CONDUCT AND CONDIMENT"

A SAGE once remarked something about the spice of life being its variety—be that as it may, most decidedly the "spice" of trout fishing is in and very closely allied with the tackle and its use —hence the "Conduct and Condiment." To explain the subtitle further the "conduct" in this instance refers more to method than to deportment while the particular "condiment" of reference is wholly the spice, sauce and relish of *fishing*—in other words the tackle.

THE BEGINNING

Just where to stop and stop on the matter of trout tackle is something of a question. There are many and sundry kinds of tackle—good, bad and indifferent. The beginner does not need the best—nor does the best necessarily cost the most.

Very likely more persons start their trout angling careers with the attractively displayed "complete sets" that sell for around $4.79 than with anything else. The most remarkable thing about these outfits is that the component parts can be manufactured, distributed and sold for so little money. However, they have an important bearing on the subject of tackle. In that manner the beginner is able to get a rod, reel, line, hooks, flies, leaders and sinkers for but very little money. We who angled through the bent-pin-and-willow-wand-age had no such advantage, nor perhaps were "five-spots" so easily obtained then as now. Thus, our progress up the scale of trouting improvement, toward the yet urealized goal of perfection was retarded. We will refrain from reminiscence, however, and begin our analysis with the very inexpensive "complete" sets of today.

Now, one *could* play golf with a croquet mallet or tennis with a cricket bat, but one does not do so because the proper use of the proper equipment is essential to bring out the pleasure-producing propensities of the games. And, so it is with trout fishing—perhaps more than with any other kind of fishing.

Thus, we find our beginner in the trout fishing game with his "croquet mallet" in the form of a $4.79 trout outfit. It's a starting point and really good enough for soaking bait—sure, he can catch fish with it, if he can with anything, but he is very liable to get wholly disgusted with the game due to the absolute inadequacy of the cheap tackle if he attempts fly casting. However, as he develops "fishitis" he'll soon be looking around for better tackle—then comes the "dangerous age" in his process of evolution. He is all too liable to apply well known mathematical proportion, or ratio of money value, to rod value. If his first rod is one of the $2.50 variety he is likely to figure that for $5 he could get one twice as good, while for ten dollars he could get a "dandy." So, unless someone stops him before he goes and buys a $10 or $12 rod, the results will be wholly discouraging for he will find that the expensive-cheap rod is but little, if any, better than the original $2.50 product.

The axiom of advising beginners on selecting trout rods is this: "If you pay *more* than $5 don't pay *less* than $35." Not that the mere price has any particular bearing on the quality of product but as yet it has been economically impossible to retail a rod requiring so much care and hand work as a *good* trout rod for less money. On up the price scale one gets but little else than pride of ownership when he pays in excess of $50 for a trout rod, as compared to one costing from $35 to $50. There is no longer any need for purchasing imported trout tackle—domestic made products are fully as good and in many instances actually superior, and may be purchased for less money when equal quality is considered.

THE TROUT OUTFIT

We must assume that all trout anglers are either fly fishermen or that they will some day strive to be fly fishermen—they all will be too, if they ever catch as many as three fish on a fly. There is simply no comparison in thrill with bait or any other method.

The essential component parts of the trout "outfit" consists of rod, line, reel, leaders and lures. They are here named in the sequence of what I consider their relative importance. The most important accessory, the rod, has previously been discussed to some extent. For the average Pacific coast fishing it should weigh from 5 to 6 ounces and it should be from nine to nine and one-half feet long. Five and one-half ounces is a good weight and an experienced angler can handle them as big as they come with that size rod. But the rod *must* be a good one.

The quality of a rod, however, is measured in casting action rather than fish-handling capacity. Without a good rod you can not cast a fly properly—that is for distance, delicacy nor accuracy.

The next in importance is the line. A proper fly line *must* be heavy. A cheap, light level line is a waste of money for any kind of fishing other than bait soaking. A very heavy level line is good—that is, a line of about $\frac{1}{32}$ to $\frac{1}{16}$ inch in diameter. But such a line costs nearly as much as a tapered line of good quality. Tapered lines come in thirty yard lengths and of several different weights. They taper from the center maximum diameter down to fine at either end. The increasingly heavy weight of line following the light end in the cast acts as a weight to push the line forward. The double tapered line may be reversed on the reel to equalize wear. These lines cost from $6 to $10 or more but one of average price is a good investment—not only for satisfactory action in casting but from the standpoint of economy for with care such a line will last ten or twelve years.

The reel is next up for consideration in sequence of importance. Nothing has ever been invented to surpass the single action reel of large diameter. They are light, easily handled and when all is said and done the main function of a reel in the average fly fishing is merely something upon which to carry line. The automatic spring reels are actually preferred by some anglers but "for why" many of us are at a total loss to understand. These contraptions are heavy and when they get out of order they are *out,* and if there is any advantage in using them it is very little, not nearly enough to offset their definite drawbacks.

A good single action fly reel can be purchased for $5 or $6 and it will be quite as good as one costing upward of $20.

Next comes the matter of leaders. A six-foot tapered leader is good for the average fly work, however, a nine or ten foot one is better though much more expensive. For "slap-stick" wet fly fishing in a rapid stream a level leader is quite good enough and may even be bought in coils to be cut and tied as needed. For "real" fly fishing only one fly is used and that on the end of the leader. Loops and unnecessary knots should always be avoided as they tend to unduly disturb the water.

And now for the lures—in this instance flies. There is a great diversity of opinion and many conflicting ideas on this matter of flies. No two anglers will wholly agree although there are some points of common ground.

In the first place there is the matter of patterns. In America we have been educated on English patterns. There is no limit to the selections of patterns, basic and variable from the basic. Many of us have dozens, yes, hundreds of flies in our various boxes and books which we have never even wet. When one gets to know his streams and localities he will pretty well know what he is going to use—then he will go out and buy two or three dozen different flies which he knows perfectly well he will not use—that old pride of possession—but then, there's always a chance that one might want an otherwise unavailable pattern.

Generally speaking, the California fly fisherman will have all the sport he wants with something like the following list of patterns: Royal Coachman, Gray Hackle, Brown Hackle, Black Hackle, Black Gnat, Black Ant, Red Ant, Cow Dung, Salmon Fly, Yellow Forked-tail, Black Forked-tail, McGinty (Bee Fly) and then maybe a few odds and ends just for the fun of having them along. The Royal Coachman and Gray Hackle will get him a long way in most waters and were I confined to selecting but two patterns, these two would be my outstanding choice.

Now, as to size and type of fly. Here's wide choice again. For the larger waters, such as Feather River, I personally prefer a large fly in the early season—say even a No. 6, a No. 10 or No. 12 will be better along during August. For the average fishing, however, a No. 10 is about right and the No. 12 may be used to good all around advantage. Late in the fall the midget flies prove the best of all—even as small as No. 18 or No. 20 but these usually have to be tied to order.

For type, in my opinion, there is but one and that is what is known as the eyed dry fly—that is, without loop or snell. It is some trouble to tie them on the leader but well worth the trouble. Fish them either wet or dry. Usually they are the better tied fly and the "weakest link" in your whole outfit is the union beween the metal hook and the snell—so make your own fresh ties with each change of fly. In doing so, however, do not attempt to untie the leader; clip it off then use a new section of leader to make the new tie. Learn to make a double-barrel knot—it's the best.

Here is a good place to make a bit of a suggestion about hooks. The barbless hook is something well worthy of far more extensive use than it enjoys. An erroneous impression has gotten abroad that the barbless hook is something of a "sportier" proposition than one of the barbed variety. That is not true—they will hold fish with equal tenacity as compared to any barbed hook going. They have three distinct advantages well worth considering. They will hook more fish than a barbed hook due to the extreme ease with which they penetrate. To be sure,

some fish will be hooked very lightly and the percentage of lost fish may be higher than with a barbed hook, but the increased number of fish hooked will result in a larger catch and much more action. Another advantage is the ease with which small fish are released from the barbless hook—not with the mere slackening of line as has been erroneously stated in many instances, but by merely holding the hook by its eye and allowing the small fish to slide back into the water practically unharmed. This is really very important and by this one virtue the barbless hook has become an important accessory of conservation. Then the third feature is that of safety—one who has had the painful experience of extracting a barbed hook from his flesh or even the troublesome bother of getting one out of his clothing will readily appreciate this advantage.

Certain patterns of barbless hook flies are available as a stock product and any fly tyer will use them when specified in making flies to order.

Don't expect to get much in way of flies for less than $2 or $3 a dozen. There are many patterns and variations in addition to those named, such as a wide selection of wing positions and body construction—they are known as "full flight," "spent wing," etc. It's a lot of fun to play around with different patterns—if you can afford that kind of fun but the old stand-bys are good enough for most of us.

It would not be fair to entirely ignore at least mention of some other very creditable lures. The spinner in small sizes is a good lure—but don't ruin your good fly rod and disposition by trying to cast them like flies. The "Oreno" family—plugs—the wobblers—feathured lures and combinations are all good for times when they are not hitting flies or while one is developing his fly fishing. But if there are any words in fishing "lingo" which are synonomous they are "trout" and "fly."

Now that we have given a lot of consideration to the "condiment" let us briefly outline some points of "conduct."

Fly fishing has been shrouded in a cloak of mystery. One of the greatest retardants to this greatest of all angling pleasures has been the erroneous impression spread around that high skill in casting is required to catch fish on artificial flies. A lot of "hooey"! Don't shudder, you experts, that's true and you know it. Remember when you used to find a nice open swift place with a back eddy below, then cast about three-quarters up stream allowing your fly to sink and be pulled down by the current into the back eddy—well, you got fish didn't you, and with a lot more thrill than with bait or any other kind of "presentiment"? If you want to convert the users of the lowly salmon egg bait into members of the great fraternity of fly fishermen tell them how to begin —don't fill them up with a lot of "guff" about what a high peak of perfection they will have to attain before they dare venture forth with flies.

And to you beginners: just try sunken flies in fairly fast water in the above mentioned manner. Then see what you can do about casting behind that rock over there—yes, right in the quiet place—then try to hit the rock so your fly will bounce off lightly into the water where you want it to hit. In other words, *try* and watch results—catch three fish on fly and then you are forevermore a fly fisherman.

As your prowess develops—and remember the *good* rod and *tapered* line essentials—try other tricks. Pick out a patch of still water and try for delicacy—that is, make the fly waft gently on to the glass surface of

the water *before* the leader hits. That's not easy, for now you are striving for perfection—the ultimate, just like the rest of us. And then practice for accuracy—place your fly in the shaded waters under the overhanging bushes across the stream (don't worry about losing a few hooks), then try for various predetermined choice looking spots; don't worry about so much distance—that's the least necessary requisite of all.

Just keep at it—if you don't get fish at first eat beans and bacon but don't give up.

In conclusion, here are a few things to remember: "Always fish upstream. Fish head upstream when they feed, so by working upstream you are not placing yourself in a conspicuous position. Wade only when necessary—you may shout, talk, shoot guns or make any sort of noise above water without disturbing trout but concussion caused by rolling stones or similar underwater noises will immediately alarm them. Never cast a shadow across the water until after you have fished a particular spot; avoid bright flashy trimmings and accessories; waders are far superior to hip boots; never depend upon rubber soles for wading, felt or leather are safer; and above all strive to be a fly fisherman, wet first, then dry—get pleasure out of fishing more than just the act of killing fish and then you will have reached the trout anglers' *Utopia.*

THE CALIFORNIA SEA LION CENSUS FOR 1930

By Paul Bonnot

NO CENSUS of the sea lions was made in 1929, and in view of the fact that recommendations to the Legislature at the coming session might be desirable, it was thought advisable to determine the status of these animals for the year. The 1930 census was made between the middle of June and the middle of July at the height of the breeding season. The new patrol boat *Bluefin* was used in the southern part of the State and about the islands. On the island cruise three men with nets and crates from the San Diego Zoological Society were aboard in an endeavor to obtain Steller sea lions for the San Diego Zoo, as there are few of this species in captivity. They failed to make any captures. This was due to several reasons. The net, while no doubt efficient in taking Californias at the Coronado Islands, could not be manipulated on the bare ocean-washed rocks favored by the Stellers. At the only place available for capturing the sea lions they had been well shot up by trimming hunters a week or ten days before we arrived, and the remaining animals were very timid and had moved out to more inaccessible locations.

The conditions pertaining to the sea lions and their relationship to the fishing industries remain about the same as previously reported.*

During 1929 and the first part of 1930 the sea lions as a whole have suffered materially from sportsmen, fishermen, trimming hunters and collectors. Sportsmen and fishermen never lose an opportunity to shoot

* Bonnot, Paul. Report on the Seals and Sea Lions of California. Fish Bull. 14, 1928.

sea lions when found in the vicinity of fishing operations and if a hauling ground or rookery is known to be close to such fishing grounds they are sometimes shot up on general principles. Such shooting is irregular and does not seem to lower the population to any great extent.

The professional trimming hunters and collectors, however, are a serious menace to the sea lions, especially the Californias. The collectors who take the animals for zoos and circuses, and who take only California cows when possible, have harried the Californias on the Channel Islands to such an extent that several of the larger rookeries have been materially reduced or abandoned.

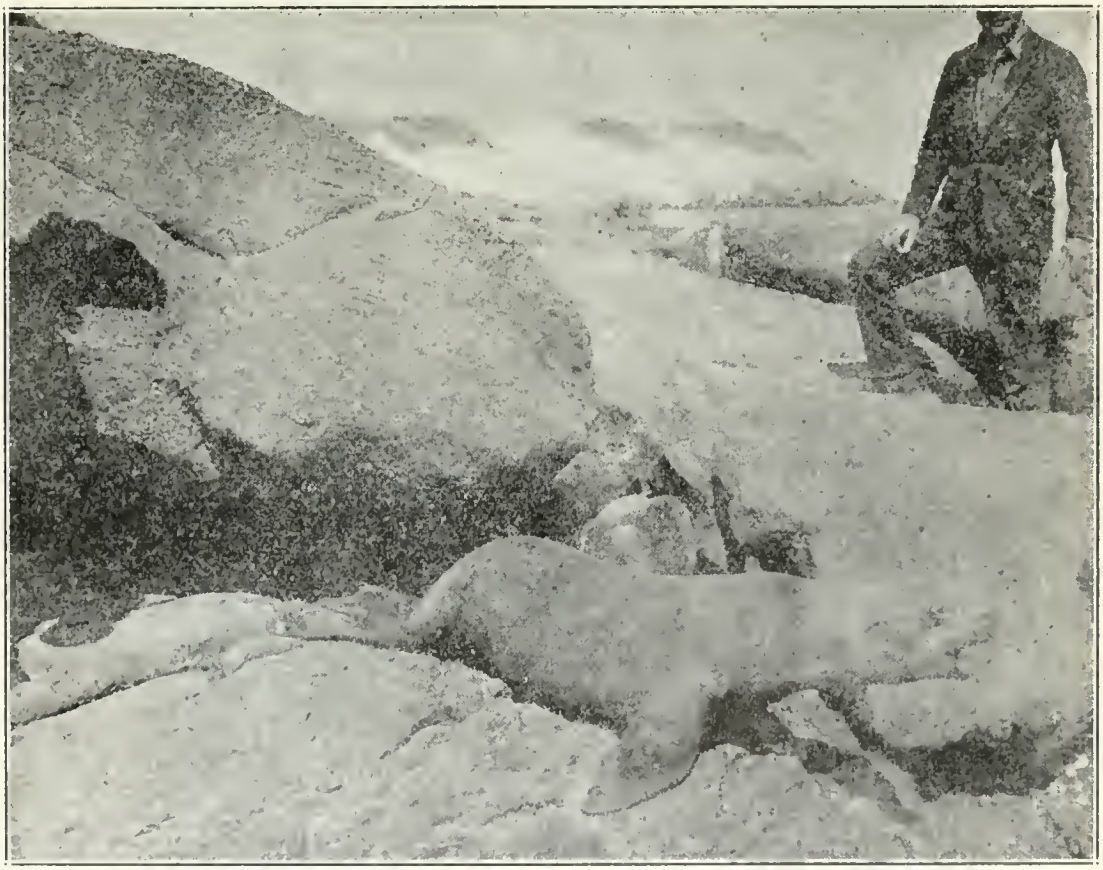


FIG. 50. Not very enthusiastic about human company, this Steller yearling made for the water as soon as his hideout was discovered. When cornered, sea lions snap like dogs. Photograph taken on San Miguel Island in July, 1930, by Paul Bonnot.

About the west end of San Miguel Island the killing of the bulls of both species has aided the efforts of the collectors and the Californias have left in large numbers. The California rookery on Santa Barbara Island has been abandoned this year, due to the activities of the collectors. At San Miguel Island and along the northern coast a large number of Steller bulls was killed last year and also this year, with the result that a good many of the smaller rookeries of both species and several mixed rookeries have been abandoned and the larger, more protected rookeries have increased in numbers. This would seem to indicate that the animals driven from their own rookeries have gone to swell the population of the larger ones.

The chief enemy of the Stellers at present are the trimming hunters who kill the bulls in large numbers and it is surprising that there are enough large bulls to carry on the necessary breeding. The Californias suffer from the collectors who work at all times of the year and who are responsible for the death of many pups, inasmuch as they take cows only. They also kill or drown a certain number of undesirable animals accidentally taken in the nets while they are working.

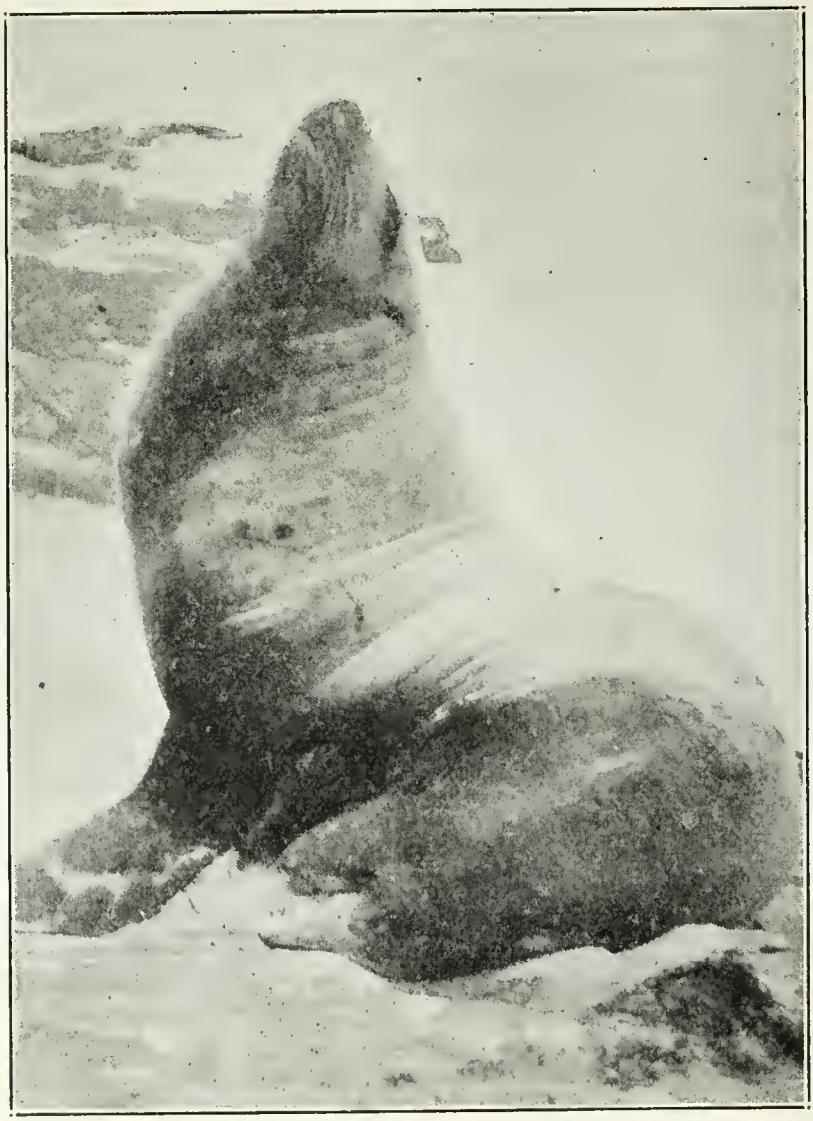


FIG. 51. An old Steller cow, blind and nearly toothless, found at Adams Cove, San Miguel Island, in June, 1928. She was shot and used for a museum specimen; in her stomach were three greenish colored skate eggs. Photograph by Paul Bonnot.

Notes on the Main Rookeries.

Seal Harbor, San Clemente Island. June 27, 1930. (Estimate) 340 Californias.

This rookery has increased in size, no doubt receiving the animals from the rookery on Santa Barbara Island which is abandoned this year. The animals were distributed about the crescent-shaped harbor as usual. Some of the smaller beaches which two years ago were occupied by only half a dozen animals were inhabited by thirty or forty. There

were a number of young bulls on a rock to the southeast, not used in 1928. There was a good showing of pups. By count, 170 alive and 6 dead. There were a few more, no doubt, in places which I could not reach which would bring the total to 200. The pups were well grown and most of them able to swim well enough to take care of themselves in the water.

Frazier Point, Santa Cruz Island. June 29, 1930. (Count) 40 Stellers, 95 Californias.

This rookery two years ago was occupied exclusively by Californias. This year there was a mixed rookery of both species. This observation moves the southern end of the breeding range of the Stellers from the west end of Santa Rosa Island to the west end of Santa Cruz Island. The rookery was formerly located in the cove under the point but it is now around the point facing Santa Rosa Island at the base of basalt bluffs. The situation is not as sheltered from the sea as the other but it is much harder for collectors to get at the sea lions, which may



FIG. 52. These young and curious California sea lion pups are only a few days old. Photograph taken at Seal Harbor, San Clemente Island, by Paul Bonnot, on June 23, 1927.

account for the change. The sea lions unloaded as soon as we appeared, which looks as though they had had experience with boats.

San Miguel Island. June 30, 1930. (Estimates and counts) 620 Stellers, 205 Californias.

The west end of San Miguel Island was worked by trimming hunters a week or ten days before the census was made. There were four dead California bulls on Isthmus Rock and 22 dead Steller bulls on Offshore Rock and Point Bennett. Offshore Rock is not very accessible and there is a fair sized Steller rookery there. I counted 45 well-grown pups. We made two attempts here to capture Stellers for the San Diego Zoo. While we were on Offshore Rock attempting to capture Steller sealions, the crew of the *Bluefin* took several hundred pounds of rock cod about a quarter of a mile from the rookery. Richardson Rock supports a large rookery this year. This rock comes straight up from deep water and it is a hazardous undertaking to land on it. I saw no evidence of trimming hunters here. Flea Island still has a mixed rookery but it has also been harried by trimming hunters and collectors.

Point Carmel. August 8, 1930. (Count) 49 Stellers, 160 Californias.

This mixed rookery, on Whaler Rock, about one-eighth of a mile from shore, is the northern breeding rookery of the Californias. I could not land on the rock and from shore I could not see pups but I could hear them squalling. The Californias, as usual, were in the sheltered coves, the Stellers out in the open.

Ano Nuevo. July 14, 1930. (Estimate) 2500 Stellers.



FIG. 53. A small section of the Steller rookery at Ano Nuevo. Bulls and half-grown bulls can be distinguished in the foreground. Photograph by Paul Bonnot, July 2, 1928.

This rookery is larger and more prosperous than it has been for years. The adult population has greatly increased, due, no doubt, to an influx from smaller rookeries up and down the coast, which have been shot up extensively during the last year. Pups were numerous (estimate 1200) and there were very few dead ones. The big bulls were scarce on the day of my visit but the light keeper told me that at least one-third of the large harem bulls had already left.

Farallon Islands, July 11, 1930. (Estimate and count) 900 Stellers, 28 Californias.

The Farallon Island rookery is slightly larger than it was two years ago. The Californias here were all small yearling cows. There were no California pups. I saw only one small California half bull at some distance from the cows.

Cape Mendocino, July 17, 1930. (Estimate.) 1000 Stellers.

In numbers the Cape Mendocino rookery is a little larger this year than formerly. The number of pups have not increased appreciably. The trimming hunters who have worked here for several years were hunting as usual. They killed 92 bulls (6 lost and 86 recovered). They were about through for the season.

Several of the smaller hauling grounds have been omitted in this list, as they seem to be only temporary places or were not used at all in 1930. I was unable to check some of these smaller places, but the ones I did check were for the most part abandoned. The fact that

there are more Stellers than there were two years ago may be accounted for by migrations from the north where they still hunt sea lions under a bounty system. The Californias show by their decrease in population the results of the unrestricted collecting and hunting which has been carried on in the last two years.

Bulls killed by trimming hunters, 1930: Cape Mendocino, 92 Stellers; Pecho Rock, 25 Stellers; Flea Island, 10 Stellers; Offshore Rock, 22 Stellers; Isthmus Rock, 4 Californias.

ROOKERIES AND HAULING GROUNDS OF SEA LIONS IN CALIFORNIA

Rookery	Steller			California		
	1927	1928	1930	1927	1928	1930
St. George Reef	1,500	611	700			
Cape Mendocino	700	700	900			
Point Arena	370	206	300			
Farallones	700	540	900	6	?	28
Ano Nuevo	1,500	1,500	2,500			
Point Carmel		200	49		70	160
Piedras Blancas	212	100	34	86	1	23
Pecho Rock	135	95	300			
San Miguel Island	595	592	620	149	429	205
Sandy Point	49	38	12			
Frazer Point	2		40	63	88	95
Gull Island	18	10	5	150	105	68
Anacapa Island				34	27	11
Santa Barbara Island				125	327	8
Catalina Island				15	40	23
Seal Harbor		1		235	228	340
Castle Rock				29	23	7
Totals	5,781	4,593	6,360	892	1,338	968



FIG. 54. California sea lions basking on the rocks at Piedras Blancas. The big bull on the right evidently doesn't approve of the photographer and he is barking his decision to the other members of the family. Photograph by Paul Bonnot, July 5, 1927.

HISTORY OF ZOOLOGICAL EXPLORATIONS OF THE PACIFIC COAST

By Dr. David Starr Jordan*

THE FIRST person associated with the study of the fishes of the coast was the German naturalist Steller, who was sent by the Russian Government in 1731 to study the animals of Alaska. Notable among his discoveries was the great arctic sea-cow *(Rytina stelleri)*, a skeleton of which is now owned by the Academy of Sciences. He published an account of the salmon of Alaska, describing five species in all, under Russian names. These five species still stand, and nothing new has since been added to our knowledge of the salmon of the coast. He also studied the trout and his conclusions have proved in general correct. Indeed, there has not since that time been a stronger man on this coast, and every ichthyologist must do honor to the ability of a man who was able to follow out all the complicated species of salmon and trout, before the time of Linnaeus.

Walbaum, a compiler of natural history, affixed scientific names to these salmon and trout in a work published in 1792, and his name is accordingly cited as authority for the species which Steller discovered and described.

Another naturalist in the employment of the Russian Government, named Pallas, printed in 1811 an account of his explorations in the same country that Steller had visited, but his work was apparently not very highly appreciated at the time, for it was not distributed until twenty years later. Pallas' trip across Siberia was notable for the discovery of the mastodon in the ice. His work was carefully done, consisting largely in authenticating by repetition the work of Steller, although he also discovered many new species in Alaska.

The above period may be considered as constituting the prehistoric epoch in the history of Pacific coast explorations. In the second stage may be mentioned the work of Gairdner and Kittlitz. About the year 1830, Dr. Gairdner, a physician living in Astoria, collected many fish, especially salmon and trout, which he sent to Sir John Richardson to be described in his classic, *Fauna Boreali Americana*. At about the same time an unknown German named Kittlitz recorded a single new species of fish.

In 1849 the modern history of California began, and with the host of emigrants that flocked to the Pacific Coast came a number of men interested in natural history. In the year 1852 a number of papers appeared on science, the most extensive and spirited writing being done by Dr. W. O. Ayres. His papers, as was customary at the time, were first presented to the California Academy of Sciences, appearing on the following morning in the *Daily Placer Times*. These papers have since been reprinted in the regular Proceedings of the Academy. Dr. Ayres described a considerable number of new species of fish from the coast

* An address before The California Zoological Club, January 16, 1892, reprinted from *Zoe* (A Biological Journal), Vol. III, No. 1, April 1892, pages 86–90.

in a very creditable manner, but the severe criticisms of Dr. T. A. Gill eventually drove him out of the work.

Dr. W. P. Gibbons of Alameda, about the year 1854, became interested in the most unique feature of the ichthyology of the Pacific—viviparous fish. Some twenty species of viviparous surf fish are known from the Pacific coast of America, and with the exception of two others found in Japan, form a unique group. Dr. Gibbons described all the species he knew, but at about the same time Prof. Louis Agassiz received specimens which he also described. Much difficulty and confusion has thus resulted in regard to the priority of names, although in the majority of instances it has been determined that Agassiz had priority of date. Agassiz also published the first descriptions of many species of fish from Washington and Oregon, although he never visited the coast himself.

Dr. Charles Girard, who was connected with the Smithsonian Institution, also described a number of the viviparous fish, which served to increase still further the difficulty of establishing priority of names.

Allusion was next made to the work of Dr. J. G. Cooper, who was present at the meeting. Dr. Cooper began work in 1856, on the fishes collected on the Geological Survey, mostly from the southern part of the State, and much of the early investigations in that region were due to him. He described, among other things, the most vicious of the sting-rays from the harbor of San Diego, naming it after a young boy who had the honor of being the first person known to be stung by it.

The Pacific Railroad survey was finished early in the fifties, and the fishes were described by Dr. Charles Girard, a pupil of Agassiz. Despite his unusually good facilities in the way of specimens and books, he did no really good work. He described a vast majority of the fishes of the coast, but in a very wooden way which proved a great set-back to the study of ichthyology. Girard indeed did all a man could do to make it difficult to determine the trout.

Andrew Garet was at the Academy at about this time, but he did no work on the fish of this coast excepting the description of one new species from Mexico. He contributed some valuable additions to our knowledge of the fishes of the Sandwich Islands, however.

George Suckley, a surgeon in the War Department, was stationed in Washington and Oregon, and supplemented the work of Girard on the fishes of that district. He succeeded in carrying the confusion to an extreme, making as many as three genera from a single species of salmon, founded on differences of age and sex.

Dr. Theo. N. Gill, who has been connected with the Smithsonian Institution for the past thirty years, has published descriptions of many fish that have been sent him, although he has never made any collections on the coast personally. Being the most learned student of fish in America, he has occupied a unique position as a critic, and is undoubtedly the best scientific critic the world has produced.

In 1865 Alexander Agassiz wrote a work on the viviparous fish of the coast, settling most of the disputes in regard to priority of names. This closes the period of the discovery of California fish. The presence of the viviparous surf-fish and the viviparous rock-cods, and the other general outlines of the coast fish, were by this time generally known, although but little attention had been paid to the species inhabiting the deep seas.

In the present period Professor Cope has described a number of new species, mostly from Alaska. Dr. Steindachner, a brilliant German scientist, found a number of new species. He investigated the salmon question to some extent but gave it up as a hopeless task and published nothing on the subject. Most of the fish which he described were from southern California and Mexico, his work being for the most part very accurate and his figures unparalleled for the fineness of their execution. In 1879, a versatile Englishman, an editor, engineer, poet and naturalist, was at work in the Academy. He described a number of new species and made a critical study of the flounders of the coast.

"In 1880," said the speaker, "it was my good fortune to be sent by the United States Fish Commission to make a survey of the fishes of the coast, abundant facilities of every sort being provided." Seventy-five new species were discovered and the salmon question was settled, practically as it had been left by Steller. Prof. Gilbert, who was his clerk and assistant, has since become very prominent as an ichthyologist. He has spent two years at work on the *Albatross,* making many important contributions to our knowledge of the deep sea fishes of the Pacific.

Dr. T. H. Bean visited Alaska in 1880, and reached the same conclusions regarding the trout of Alaska that the speaker had drawn from his studies of the California fish. Mr. E. W. Nelson also made a good many observations upon fish while stationed in Alaska. In San Diego Miss Rosa Smith worked on fish, and has the honor of being the first woman to describe any new species. Dr. Eigenmann carried on work at San Diego and San Francisco, and accomplished considerable on the study of the fish of these places.

For the last three years the United States Fish Commission steamer *Albatross* has been at work on deep sea soundings and dredgings, Mr. C. H. Townsend being the naturalist of the vessel during all this time. The results of these dredgings have been of great importance, about three hundred new species having been discovered, many of them very startling and impossible forms. The whole fauna of the abyssal deeps is very strange and peculiar. The fish are soft-bodied and have either very large eyes to enable them to catch the faint glimmerings of light which may reach them, or else are entirely blind. Many species are provided with curious phosphorescent lanterns to enable them the better to find their way about. Practically nothing was known of these remarkable fish before the work of the *Albatross* brought them to light. Occasionally one would be found washed ashore after a storm, or in the stomach of some larger shore fish, but by far the large proportion of them were totally unheard of.

PRAWN FISHERY STARTED AT MONTEREY

By J. B. Phillips

A PRAWN fishery is developing at Monterey. Not enough is yet known about the extensiveness of this shrimp-like crustacean in the waters off Monterey to predict an industry. More pioneering remains to be done. However, the facts to date are: About August 15, 1930, an octopus (cuttlefish) fisherman, S. Gianini, brought to Manuel Lewis, a fresh fish retailer on the fisherman's wharf at Monterey, about 50 pounds of a large shrimp-like crustacean. This crusta-

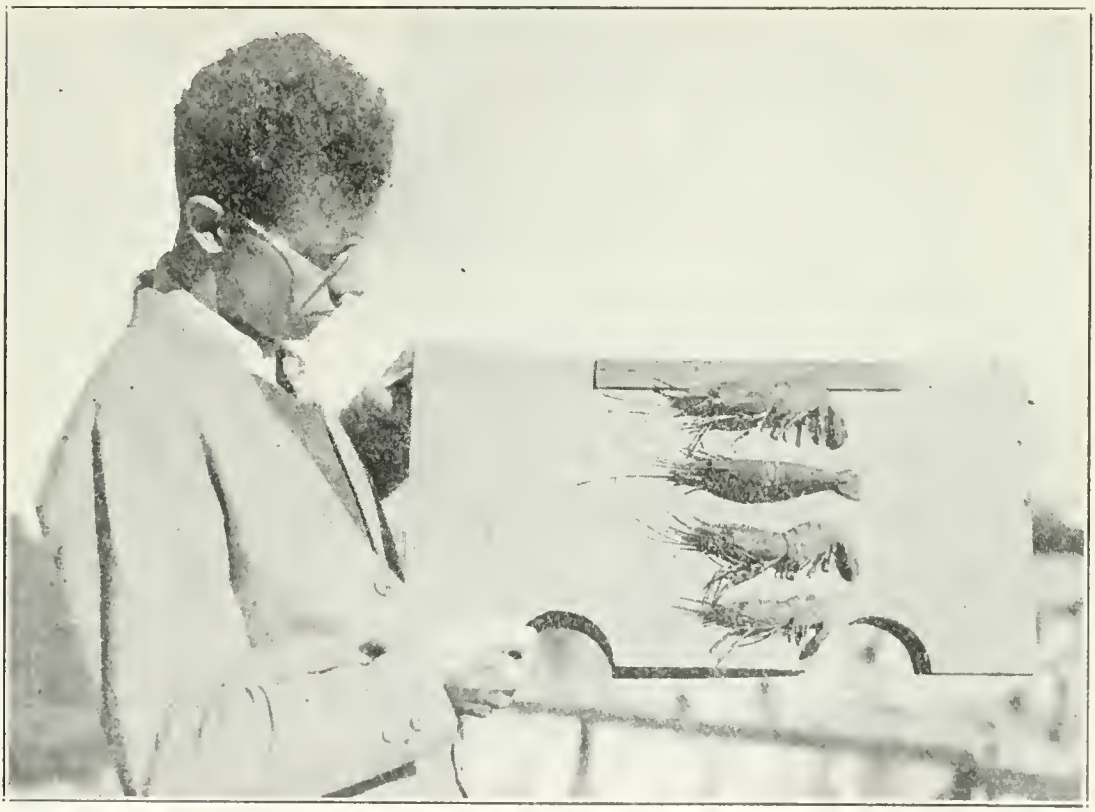


Fig. 55. Several of the larger specimens of Monterey prawn (commonly known as shrimp). Note saw-toothed rostrum projecting over top of eyes; also the very long feelers or antennae. A twelve-inch rule rests over the topmost prawn. Photograph by J. B. Phillips, November, 1930.

cean was immediately given the name of "Monterey shrimp." No trouble was experienced by Lewis in disposing of his initial display at 75 cents a pound, cooked. At the present time this fisherman brings in about 100 pounds a day, weather conditions permitting. His record delivery so far is 250 pounds in one day. Lewis is still disposing of all that he can display at 60 cents a pound, cooked, or 50 cents a pound, green. The fisherman receives 30 cents a pound, according to Lewis. Except for a specimen of this crustacean that this same fisherman brought to Lewis several years ago as a rarity, no prawns or shrimps have been taken from the Monterey region in the past. The bulk of

Contribution No. 106 from the California State Fisheries Laboratory. November, 1930.

the California supply of shrimps and prawns (indiscriminately) comes from the Gulf of Mexico, with San Francisco Bay and Alaska furnishing their quota.

As closely as can be ascertained, the Monterey prawn is found in about 150 fathoms of water about three miles west of Point Cypress (between Point Pinos and Carmel) on the edge of a steep slope. The first prawns were accidentally caught in regular octopus traps. Gianini has modified his octopus trap somewhat in order to catch prawns more successfully, by using a rattan construction mainly instead of metal, the form of the trap remaining the same. These traps are between 4 and 5 feet tall; they are 3 feet in diameter at one end, tapering in a curve to about 9 inches in diameter at the other end. There is but one mouth in these traps, which is in the form of a funnel at the large end. This funnel is about 2 feet long and starts from the sides of the trap. It ends in the center of the trap with an opening of about 6 inches in diameter. The small end of the trap is simply a hinged metal screen door through which the trap can be baited or the contents removed. Rattan of about $\frac{1}{8}$ inch in diameter is used in the construction of these traps. The rattan is spaced about an inch apart and forms a mesh of close to $2\frac{3}{4}$ by $1\frac{1}{4}$ inches. Reenforcing circular rattan or wire bisects this mesh so that triangular spaces of 1 to $1\frac{1}{2}$ inches on a side are formed. It costs Gianini $10 to build one of these traps, and he has twenty-four of them in use. The traps are baited and then weighted to carry them down to or near the bottom. Gianini is completing an experimental trap that he will try out soon. This trap is a little larger and has a funnel at either end, the trap door being at the side.

For convenience sake, the name of "Monterey shrimp" has been attached to this prawn because of its comparatively close relationship to the shrimp. According to Dr. Tage Skogsberg, of the Hopkins Marine Station at Pacific Grove, this is not a shrimp, but a prawn, belonging to the species *Pandalus platyceros*. Among the California fishermen, no distinction, unfortunately, is made in most cases between shrimps and prawns. The main points in which a prawn differs from a shrimp are as follows: The prawn is usually larger; it has a long saw-toothed rostrum projecting forward from between the eyes (this is comparatively short in the shrimp); the very long feelers are often longer than the body; and the abdomen is large, strong and compressed. In general, the prawn is taken in the deeper, open ocean waters, usually over rocky bottoms, while the shrimp is taken in the shallow, sandy bottom bays.

The United States Bureau of Fisheries has recently (1929) issued an interesting paper, entitled "Shrimp Fishery of Southeast Alaska," by Frank W. Hynes (Document No. 1052). No distinction is made between the shrimps and the prawns in this fishery, although the prawns of the genus *Pandalus* and *Pandalopsis* comprise 94 per cent of the entire shrimp catch. Although prawns form the bulk of the southeast Alaska catch, the particular species found at Monterey composes only about 4 per cent of the total, the rest being made up of circumpolar varieties not found south of the Columbia River. The distribution of the prawns caught at Monterey is from Unalaska to San Diego, the species being found in from 48 to 266 fathoms. North of

the Strait of Juan de Fuca, these specimens are found in shallow water, while in the Strait and south along the California coast they are found in considerable depths. This species is the largest in the Alaska fishery, averaging 4 inches in length from end of tail to end of eye-stalks. The same mode of measurement gives the present crop of the Monterey form an average length of close to 6 inches. (Measuring to tip of the saw-toothed rostrum would add about 2¼ inches to the average length.)

So far the Monterey prawn fishery has been virtually a one-man affair. If one man can bring in such large numbers with the traps that are used, a large-scale production with the aid of trawl should net enough to create an industry, depending of course on the nature and extent of the beds. According to Skogsberg, the configuration of the ocean bottom where the prawns are being caught at the present would not permit the use of a trawl. However, investigation may uncover more favorable grounds.

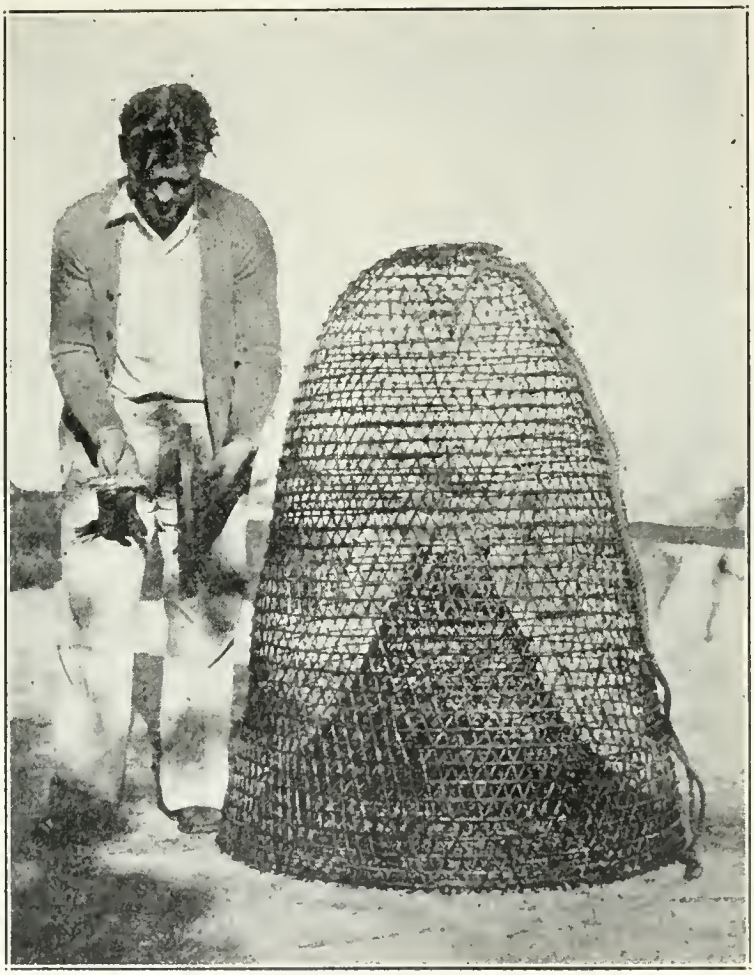


FIG. 56. One of the traps used in the capturing of Monterey prawn. These traps are practically the same as those used for devil-fish, except that it is mainly of rattan construction. Note the funnel on bottom side, ending in center of trap. The trap door at the top can also be seen. The author is holding a prawn in either hand. Photograph by Joe Wales, November, 1930.

In the southeast Alaska shrimp fishery (to quote Hynes) motor vessels equipped with beam trawls are used exclusively. These are of three types: the Puget Sound purse seiner, the halibut schooner, and a hybrid resembling a salmon troller. Most of the shrimps are taken by the intermediate type or the purse seiner. It is easier to handle and more economical than the halibut schooner and can be used virtually anywhere that the salmon troller type can be operated, taking nearly twice as many shrimps with but additional expense.

The beam trawl is the only appliance used in the capture of shrimps in Alaska waters. It has been modified somewhat, but remains the same in principle. Various sizes are used, from 16- to 60-foot beam. Except for size, all are constructed on exactly the same plan. A rep-

resentative beam trawl used by a purse seine type of boat is as follows: beam, 36 feet long with 9-inch diameter in center and tapering to 5½ inches at ends; bottom line 7-inch manila, 41 feet long; hauling cable of ½-inch woven wire; bag of heavy tarred hemp web, 1¼-inch mesh and 200 meshes deep. The cost of this beam trawl, including gears, winch, cable, beam, and web, is (1927) approximately $800. The otter trawl was tried in Alaska, but it was found that it could not be regulated to the variety of bottom conditions found in Alaska. The Chinese bag nets and traps used in San Francisco Bay can not be used because of the depths encountered.

Nevertheless, the "otter trawl" is a more modern type of trawl and is easier to handle. It gives much more of a mouth spread than the beam trawl, due to the absence of a beam and the substitution of otter boards on the sides. The otter boards keep the net open because of the resistance of the water. When the otter trawl is taken from the water the boards come together, making the net easier to handle. Scofield gives a description of the otter trawl in one of the past issues of California Fish and Game (vol. 4, no. 2, pp. 93–94, 1918, with a diagram showing a steam trawler and otter trawl on p. 95). Scofield compares the "otter trawl" and the "beam trawl" with the "paranzella net" in his paper, "Parenzella, or Trawl Net Fishing in California." This article is reprinted from the Transactions of the Second Annual Meeting of the Pacific Fisheries Society, held at San Francisco, August 9–11, 1915.

In Alaska, according to the available data given by Hynes, there is little if any variation in the seasonal abundance of commercial species. At times the shrimps do, however, move very rapidly from one portion of the grounds to another, but this movement is possibly occasioned by the exhaustion of food in one area.

HAS THE PHEASANT A CREDIT BALANCE WITH THE FARMER?

By Adolph A. Oliver

FOR MANY years I have been interested in the great out of doors and particularly in wild game birds. Since 1912 when the first State game farm was established about a mile and a half north of Mount Eden, I have become very much interested in such exotic species as pheasants, Hungarian partridges and other birds brought in to replace the depleted stock of our native game species.

The distribution of birds from all sources and the dispersal of escaped individuals from private hatcheries has increased the pheasant supply in the Mount Eden area so that on the cold, winter mornings I can see them sitting on fences by the dozens waiting to get warmed by the morning sun. I am a diversified farmer, raising products maturing for market every month of the year, and I have been watching pheasants around the ranch for a good many years. The last year there has been a growing doubt whether they have a credit balance with the farmer.

Some time within the last 100 years when the grain was threshed out on the threshing floor by the oxen there was an old saying or axiom that the ox came first for his share of grain for his work performed. This is as it should be. I have never allowed anyone to shoot birds on my farm as we feel that as the linnets take most of our cherries now, we hope that the trees will bear enough in a few years to give the birds their share for a few weeks of the year for the good they are doing during the many months there are no cherries and they are living on insects and worms, thus helping us to raise garden truck.

Now for the debit side of the pheasant. They play havoc with the ripe tomatoes, going through the fields and picking a small hole in each tomato, then moving on. These holes allow the formation of moulds and spores which mean the tomatoes can not be sent to the market or cannery. When wheat and barley are sown and there is no rain to sprout them the pheasants are busy scratching and turning over the

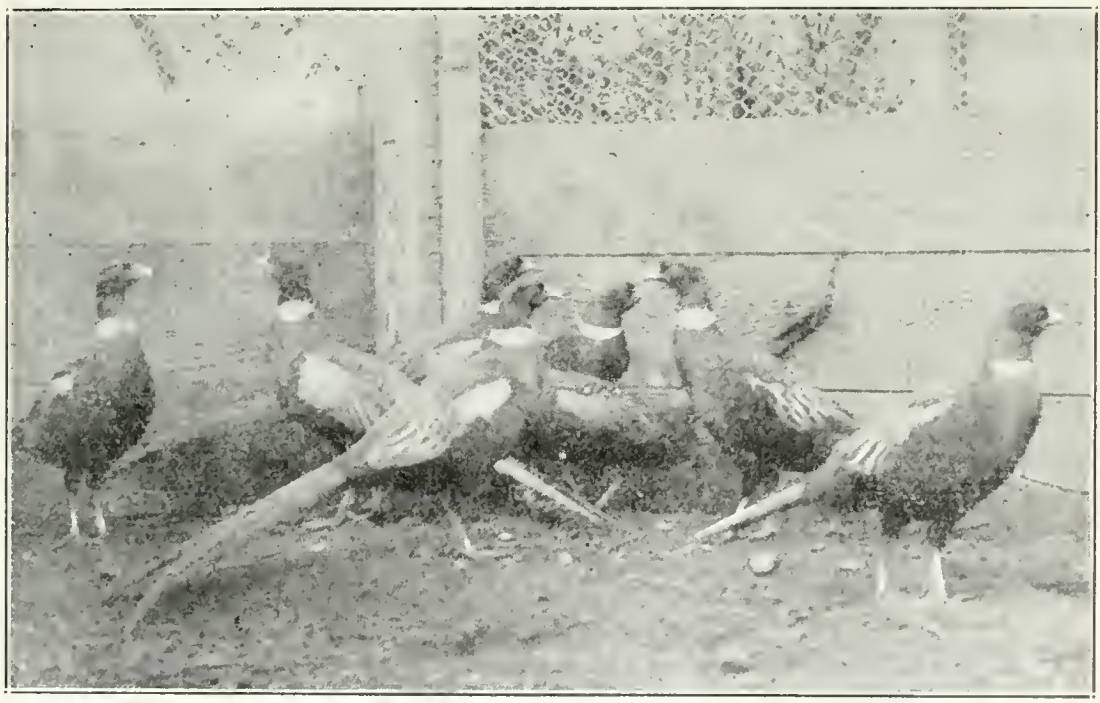


FIG. 57. Ring-necked cocks at the Yountville Game Farm. Photograph by H. C. Bryant.

clods to get the seed, but we have allowed some pounds for them on each acre.

Last year during December, January and February our planting of peas suffered heavily from raids of pheasants. These are planted in rows from 24 to 36 inches apart, 80 pounds of seed to the acre. Last year this seed cost me 17 cents a pound or $13.60 per acre for the purchase of seed alone. They must be planted very near to the surface, otherwise the rain will rot the seed during the cold weather. This is the time of year when there are very few bugs, butterflies, moths and rye grass seeds for them to feed on, but oh, when they find a newly planted pea field, how sick the rows will show up when they come through the ground. The pheasants seem to know where the seeds are and do most of the digging with their bills.

Maybe I am responsible for these troubles myself. I have lots of cross fences and the land is divided into small fields. I became tired

of seeing thistles and weeds grow along these fences so I seeded these areas with alfalfa and sweet clover, which grows up three to four feet high and furnishes plenty of seed for feed and cover for nesting birds. But the pheasants have found these are the places for them to nest as the mowers do not destroy them as they do in the open alfalfa fields. I have seen many nests destroyed in alfalfa fields during haying time.

Now for the credit side of the pheasant:

First—The pheasant destroys annually great quantities of cut worms and bugs. This is a distinct advantage to the farmer.

Second—Their calls in the morning when dawn is about to break are worth something on the credit side of the ledger.

Third—The thrill I get while walking through the fields and a whole flock of these pretty birds flush at my feet is also to be considered.

Fourth—The mere sight of these birds as I drive through the roads and cross roads on the property is a thrill. Only this Thanksgiving Day as I sat with my family at our Thanksgiving dinner, and looked out of the window and counted 22 beautiful pheasants in my garden, on my lawn and in the trees I realized that after all it was worth something to have them about the place.

Have I sufficiently built up the credit side of the pheasant? Perhaps I have, but the thought comes to me of some forty years ago of Judge Stephen G. Nye, a man whom I knew intimately and a man I value as a very close friend. His fairness and honesty won him many victories and many friends. He seemed always to treat the opposing counsel as a friend. I remember one case in particular when the attorney for the plaintiff had completed his case and Judge Nye, acting for the defense, stood up and said before the court that the opposition had not made out as complete a case as he should or might have done, and said that for that purpose he would concede all the facts which the attorney for the plaintiff had sought to enlist to be true and thereupon proceeded with his defense on the merits. He won the case in short order.

Now I started this article as the plaintiff against the pheasants, thinking they had a very small credit side, but I do not know whether I have weighted down their defense beyond a reasonable doubt. I have more of these birds on my ranch than most places have on account of the protection afforded them. There is plenty of irrigation water on the place and nesting sites are abundant along the fences.

The object of this article is not an advocation of an open season. If this should occur within the next five years it could not last for many days and the birds would necessarily have to have some friends, else they would be wiped out very quickly. I have always been afraid that when I started to put my thoughts in this matter on paper the pheasant would have no credit with the farmer, but I have added the love of wild life to that credit side and I am afraid I am going to lose to the defendant—the pheasant.

"RANGER"

By Earl Soto

THE State of California has just reason, at this time, to mourn over the loss of a noble dog. The record of this fine animal will stand through the years as eloquent testimony of an invaluable service performed in an unobtrusive way.

Ranger, one of the greatest lion-hunting dogs the West has ever known, is dead. This animal, alone, probably has done more to protect and conserve the deer in our great State than has been accomplished by

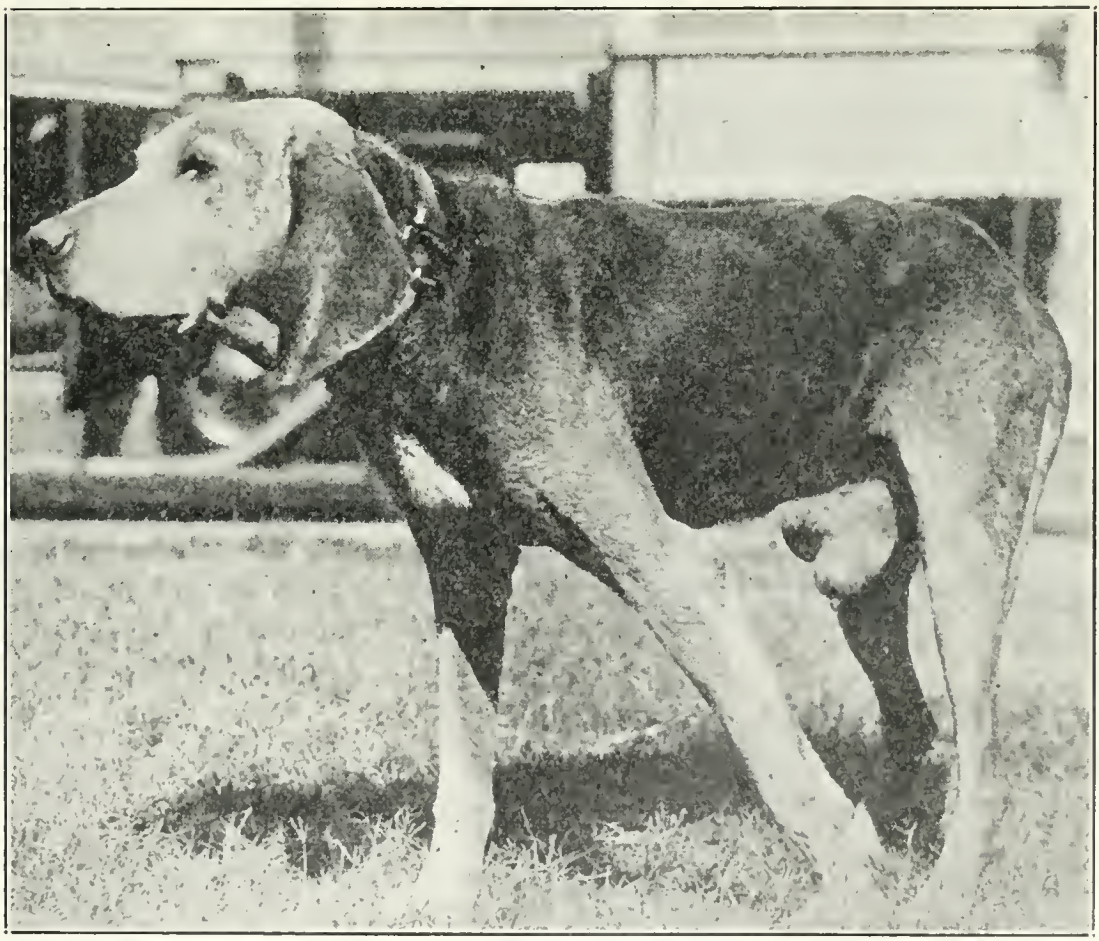


Fig. 58. Ranger—fourteen-year-old veteran of the mountain lion trails. He was killed in February by an automobile while trying to find his master, Jay C. Bruce, state lion hunter. Photograph courtesy of *Stockton Record,* February, 1931.

any other single agency. His rewards, whatever they could have been, were entirely of his own making and one can not help but admire the unselfish nature of the duty performed.

The animal was fourteen years of age. Jay C. Bruce, State lion hunter, secured the dog when a pup and trained him for the trail. Ranger led the hunter's pack of dogs for more than twelve years and during that time assisted in the taking of about 350 mountain lions.

Ranger had many narrow escapes from death in battles with wounded lions and the punishment received had its effect on his sturdy body. His last great battle occurred about a year ago on a rugged mountain side near Silver Creek.

Bruce and the dogs had tracked a female lion to her lair under the end of a large log. Two kittens were discovered. While Bruce was breaking through the dense brush the enraged mother leaped from the log for Ranger's back. The dog wheeled, lunged and secured a grip on the side of the lion's throat. Followed a terrific struggle during which the lion attempted to hug the dog with her front paws and rake his body with her deadly hind claws.

Bruce, unable to use a gun for fear of shooting the dog, rushed into the fray, grabbed Ranger by the back and literally tore him from certain death. The lion struck viciously at Bruce, missed by a scant margin, then retreated. She was treed several hundred feet away and dispatched.

Cut, bleeding and crippled, Ranger continued the hunt and discovered a hidden kitten after the rest of the pack had practically finished the hunt. He never recovered fully from this terrible experience.

During the past year Bruce had used Ranger very sparingly. He could not leave the dog at home because the animal howled and mourned until the pack returned—his heart was in the camp and on the trail and Bruce would not deny him this.

In February, Bruce made camp in the Three Rivers district. He left Ranger in camp, as usual. Ranger slipped from the leash and was attempting to follow along the highway when he was struck by an automobile. Bruce found the body several hours later.

Some are of the opinion that it was a hit-and-run accident. It is hard to believe that any person would run an old dog down and perhaps it is best to give the unfortunate driver the benefit of the doubt. At any rate California is much the loser by the accident and it will probably be a long time before another hunting dog rises to such a high place of honor in the public service.

ANTELOPE ON THE SHASTA NATIONAL FOREST

By Fred W. Johnson, Junior Range Examiner of the Shasta National Forest

In Merriam's report on a biological survey of the Mount Shasta region in 1896 he stated that there had been 2000 prong-horn antelope in Little Shasta Valley and that only a few head remained. What happened to 2000 antelope from 1873 to 1896 I learned from an old-timer.

In the hard winter of 1873, 800 antelope, weak from starvation, were playfully knocked in the head by two white men. Today there are no antelope in Little Shasta Valley, but east of this valley, between Macdoel and Mount Dome on the Modoc Forest, we counted 354 head in one day last week (January 20th).

These are the nucleus of a rapidly increasing herd that in a few years will cause us to ask, "What are we going to do with them?" In 1924 a very hard winter reduced this herd to 65 head. Since then, this herd has in eight years increased to what we believe is about 500 head. This is an increase of 33 per cent in a year. From this 500 head, if the annual increase of 33 per cent is constant, we will have 2000 head of antelope in 1936.

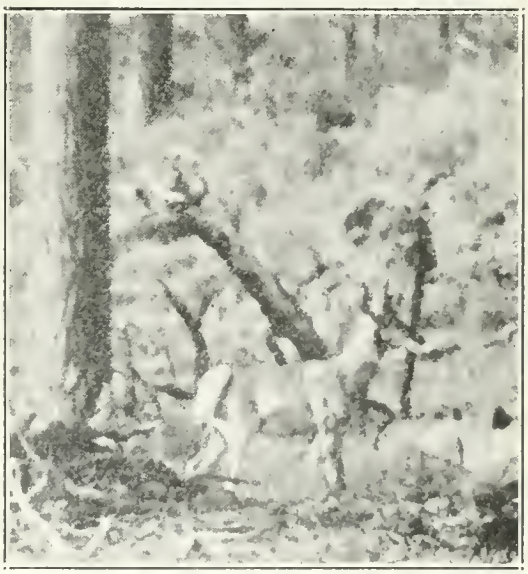


Fig. 59. Antelope ranging in the timberland in Mount Dome region in northern part of the state. Although this species is normally a rover of the open plains, civilization is forcing the few remaining animals into the wooded places. Photograph by E. S. Cheney, 1930.

We have ample summer and winter range for 2000 antelope, but above this, migration, natural or controlled, must take care of the increase. That they can be easily trapped is proved by an incident that occurred during our counting trip.

We visited Poverty Flat on the Modoc and found 14 antelope trapped in a woven wire corral. (Antelope go under fences, not over them.) The gate had blown shut and as we approached to open the gate they bucked the fence and did not try to get over. We opened the gate and all galloped out except one "old molly" who had tried to jump the fence and had caught her hind feet in the wire as she came down. We soon got her out. She was unhurt and quite docile, but complained in deep-throated goat-like bleats.

In the winter they gather in herds of 75 to 100. You find them in the juniper cover rather than the sage flats. This seems natural as better browse is found in the juniper. Occasionally they visit cultivated fields and feed on winter wheat and rye. The ranchers claim

that this "feeding down" in winter causes the spring growth to "stool out" better and are glad to have them use this feed.

The last few years of mild winters have been a big factor in the increase of this herd, as well as the help and protection of the ranchers and Fred Starr, the game warden at Macdoel. If this good work keeps up some one will get the job of wranglin' antelope in a few years.

HOW TURKEY POINT, ON WINGO SLOUGH, GOT ITS NAME

By Joseph Springer

SOME twenty years ago, in a spirit of fun and fellowship, the famous fishing point on Wingo Slough, still known as Turkey Point, got its name—and this name still holds good.

By prearrangement on a Saturday before Thanksgiving, the year of which I have forgotten, some eighteen or more members of the California Anglers Association went to Sonoma with the intention of fishing for striped bass at Wingo, which is a few miles away, on Sunday. We all met, as agreed in a hotel in Sonoma. After eating a hearty dinner, we went out for a little stroll and exercise and then it started to rain, in good old Sonoma style, and when it rains in Sonoma, it rains. In order not to get wet on the outside, we walked into one of those places where, in the good old days, you put your foot on the rail and said, "Boys, let's have another." Of course, that was before we had an open season on Volstead violators.

The gentleman who ran the refreshment emporium had, for the amusement of this San Francisco delegation, a turkey and goose raffle, on which he sold a paddle for the sum of a quarter, twenty-five cents. After selling all the chances he rolled a polygon shaped ball down a long chute and if your number came up on top you would get a live turkey, or a goose, to your choosing. It being just before Thanksgiving, nearly all of us that won took turkeys. All of the boys had one or more turkeys; some, three or four. I do not know what we paid for them, but whatever the price, they were worth it—when you consider the history and fond remembrances it leaves.

The problem before us was, how were we going to get these birds home safe and sound and still go fishing. Well, a happy idea appeared and someone suggested that we tie the feet and wings, put them in a sack with their heads sticking out; forthwith the necessary sacks were gathered to complete the job. About midnight we had the turkeys all sacked, we gathered them under our arms and proceeded to our rooms, put them on the floor and went to bed. To make a long story short, we didn't need any alarm clocks to wake us up in time for our train or breakfast.

After a good plate of ham and, the train on time, a short ride, we were at Wingo; turkeys, fishing tackle and all. It was some little walk from the railroad to the point we intended to fish, and to see approximately twenty men walking down that slippery levee (some with sacks

wrapped around their shoes to keep from slipping) with turkeys, rods, baskets, bait and what not, was a sight to behold. We arrived at the point in due time, laid our birds gently down and proceeded to fish. The fish were not quite as plentiful as turkeys that day, but poor old "Bill" Street, who has since passed away, being noisier than the rest, started to imitate a turkey gobbler. He would "Gobble, gobble, gobble," and as most of the turkeys were gobblers, they in turn gave the grand hailing sign of "Gobble, gobble, gobble," in return. Then the fun was on. All day long, just as if everything had been rehearsed, it was "Gobbble, gobble, gobble" by the gang and the turkeys (who were ever ready). If a new comer arrived, someone caught a fish or did something extraordinary, they were greeted with this new salutation.

Before leaving for home, some of the boys killed and picked their birds. Ever since that time, whenever anyone refers to this particular place, they call it Turkey Point, and the name has held good to date.

It is about fifteen years since I visited this spot, but intend to go back in the very near future and give it the once over for old times' sake.

The names of the men who were on this memorable trip, as far as I can remember, are as follows: George Wentworth, Charles Breidenstein, Bill Eaton, Bill Street, Raisch Terry, Jack Carney, Bill Augustine, Hughie Copeland, Walter Burlingame, Charles Landresse, Emil Aceret and yours truly. The first six mentioned have since passed to the happy fishing grounds. A few of the others I see occasionally, and some not at all.

I hope my readers will find as much enjoyment in reading this history of Turkey Point as I do in writing it, as it brings back memories of some of the best and most famous of California sportsmen in all times. They may not be famous to some, but they are to me, because they were sportsmen in the true sense of the word.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to Leo K. Wilson, 510 Russ Building, San Francisco, California.

APRIL, 1931

Visit your state game farms at Yountville and Chino. You will get a new idea of game birds.

SURVEY

A survey of the breeding grounds of ducks and the Canada goose in this State is at present being undertaken by James Moffitt, research assistant of the Bureau of Education and Research. It is felt that there is a real need for this work which will provide more definite information than is now at hand regarding the extent and character of California duck breeding grounds and the number of birds inhabiting them.

Estimates of the total breeding grounds acreages in the State will be made and means of increasing same will be considered. The present condition of the various duck breeding centers will be fully treated, with recommendations for future work to improve them.

A life history of the breeding cycle of each species will be given, with particular reference to conditions in California. Herein natural and artificial enemies of breeding ducks will be enumerated with remarks on the control of same. Finally, an estimate of the total number of individuals of each species breeding in each area in 1931 will be provided.

A bibliography of list of books relating to this subject in California will close the paper, which will be issued in booklet form as one of the Division's Game Bulletin series. It is planned to bring this report out before the close of the year.—LEO K. WILSON, Editor.

COMMISSIONER RETIRES FROM DIVISION

After three years' service as a commissioner of the Division, Reginald G. Fernald, of Santa Barbara, recently announced his retirement from the work. During his tenure of office many constructive ideas were advanced and sportsmen and state officials readily agree that the Division greatly benefited from his association. Although retiring from active service, Mr. Fernald, a newspaper publisher in his home city, announced that he would continue to be interested in fish and game work and would be glad to assist on constructive measures, as his time permitted.

In formally announcing his retirement to John L. Farley, executive officer, Mr. Fernald said, in part: "It is with sincere regret that our association has terminated. You have no idea how much I have enjoyed

my association with you and the other employees of the Commission, and I would appreciate it if you would express to them my regrets at leaving them and thank them for their uniform courtesy to me."

A CORRECTION

In the October number of California Fish and Game (vol. 16, No. 4, p. 369) an error appears in the article, "An English View of Fishing," by Genevieve Corwin Wheeler. The second sentence should end, " . . . easting only", instead of " . . . using dry fly only" as it now reads.—G. C. Wheeler, State Fisheries Laboratory.

SENATE COMMITTEE SHOWS VALUE OF WILD LIFE

Recommendation of a new Federal department to carry on a greater program of wild life restoration in the United States is being considered by the Senate's Special Committee on Conservation of Wild Life Resources, the committee has revealed in its first report.

The committee reported finding "convincing and undisputed evidence of a rapid disappearance of wild life" on the one hand, while on the other "a corresponding increase in the number of hunters and fishermen amounting to 400 per cent in the last decade." It presented a survey of fourteen states by the Southern Newspaper Publishers' Association which disclosed that hunters and fishermen equal the number of baseball, football, golf and tennis fans combined.

The report blamed the serious decrease of wild life on "the failure of Federal and State legislative bodies to be guided by the ordinary rules of sound business practice which require that the sums used for research, protection, administration, development and upkeep must be in due proportion to the income derived from its resources."

"The enterprise of wild-life conservation and increase viewed solely as a business matter has geen grieviously underfinaneed, and small acknowledgment or recogniation has been had of its value in dollars to the people of our commonwealths," it said.

Basing its estimate on actual figures, the committee declared the total expenditure in hunting and fishing alone in 1929 doubtless amounted to three-quarters of a billion dollars, and added:

"It is impossible to estimate, even approximately, the tremendous sums annually invested and spent by that other vast group of recreationists who are attraeted by the ennobling and inspirational qualities associated with all varieties of wild creatures and their environment. When figures are compiled they will dwarf any totals so far presented in connection with the activities of fishermen and hunters."

The committee expressed its positive conclusion that the destructive effects to wild life everywhere might have been greatly modified and in many cases actually avoided "had a national policy of conservation been earlier adopted by State and Federal governments," and declared "It is not yet too late to formulate and apply such policies with every hope of success."

"Our study has not advanced to a point which justifies our positive expression of opinion at this time in the matter of consolidation under a new Federal department of conservation, but we are leaving this suggestion open for further consideration," the committee said.

It declared that in many instances the existing appropriations are not sufficient to enable the present departments to perform their functions efficiently, pointing out that the Biological Survey has a field force of only 25 game protectors to cover all the 48 states. It recommended 75 and a supervisor.

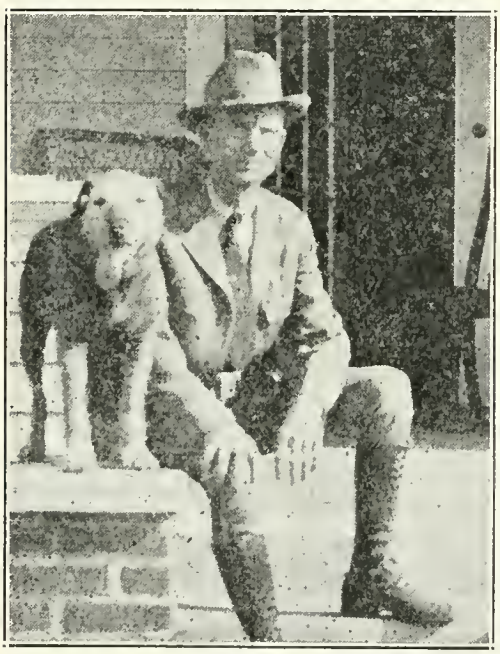
The farmers' important role in game restoration was recognized in the committee's statement that "sportsmen now realize that unless there is cooperation with the farmer, to the pecuniary advantage of the farmer, game will disappear on private property."

The special committee, after a year of investigation, hazarded that it will require at least two years more to complete its study and offer definite recommendations. Senator Frederic C. Walcott of Connecticut is chairman and Senator Harry B. Hawes of Missouri is vice chairman.

IN MEMORIAM

On January 21, 1931, another devoted worker for conservation, Deputy Rupert J. Sadler, passed away. A widow and several brothers mourn his loss, while many of his friends find it hard to believe that he has gone out from among them.

Appointed on December 26, 1924, Deputy Sadler served in the southern patrol force under Assistant Chief of Patrol Charles S. Bauder. Because of his zeal for the cause of conservation and his versatility, he was given all manner of tasks to perform. His duties varied from office work to field patrol in Los Angeles County.



RUPERT J. SADLER

Time was the essence in the installation of an exhibit in the summer of 1928 for the Division, at the Pacific Southwest Exposition, Long Beach, California. The project was handicapped for lack of workers. Assistant Chief Bauder was appealed to for aid. Deputy Sadler was detailed. Without complaint he donned overalls, laboring for a period of two weeks far into the night of each day. At all times he exhibited the same cheerful interest as though engaged in a nobler achievement like one that concerned the fate of a species of mammal or bird.

Deputy Sadler merits remembrance for one thing above all others. He labored for the Division; for the great end it is striving to accomplish, not for himself. He was a hard and conscientious worker and a faithful public servant.

He was pursued by ill health for many years, and fought a brave battle, refusing to be confined to a bed until his strength utterly failed. He was in his sixty-first year when he passed away at his home in Venice—content that his life had counted.—RODNEY S. ELLSWORTH.

CLARENCE ALBERT NIXON

In the passing of Clarence Nixon, the Bureau of Fish Culture has lost a loyal and faithful employee. Clarence Nixon was first employed at the Mt. Shasta Hatchery in 1909 as an apprentice fish culturist. He advanced rapidly and was made foreman of the Mt. Shasta Hatchery in 1917. He leaves a wife and four children to mourn his loss, besides his aged parents, who have received a double bereavement, as an older brother passed away one week before Clarence was called to his reward.

Clarence Nixon died from spinal meningitis, and it is thought the older brother, John Nixon, died from the same cause. Clarence was with his brother during the few days of his illness, and it is thought that he contracted the disease that terminated fatally in five days after he was stricken. He will be missed as only a few men are missed from their community. He was forty-one years of age.

HUNTING LICENSE TEST

Talked to several sportsmen lately and find that many of them are discussing a "hunting license test" idea. They said that editorials have been appearing in various magazines on the subject and that such a plan deserved careful consideration.

Under the plan discussed, expert examiners would be assigned to certain districts each year at given periods. The examiner should require of the applicant that he knows how to handle firearms with safety, that he is familiar with the game seasons, and that he knows not only what game he can legally take, but also what things are not to be shot at, as well as the laws affecting property rights.

When it was argued that such a plan would probably reduce the ranks of those who buy licenses—the Division is a self sustaining organization and does not receive moneys from any other source—the sportsmen declared that the deficit could be met by increasing the cost of the license in proportion to the needs. They argued that a hunter would be willing to pay more for a license if he knew that the dangerous and wasteful novice was eliminated from the field.

Figures were produced which showed that California has gained nearly six million in population in the past 80 years, has about 150,000 miles of automobile road at this time, that there is an automobile for every 2.8 persons in this state, that there are about 1000 listed airplane landing fields, and many other encroachments of civilization, all of which they declare are making deep inroads into our conservation efforts.

It was also shown that probably 100 persons are victims of gun accidents each year, many fatal, and 90 per cent of these can be attributed to ignorance on the handling of firearms. Not only that, but they pointed out that 2500 arrests are made annually for game violations, many of which are due to ignorance of the law and seasons; and the amount of game sacrificed would reach an astounding figure.

Of course the idea seems to have its merits on face value, but whether it could ever be worked in a practical way is a question for debate. What do you think about it?

MENTAL TESTS FOR HUNTERS

Mentality tests for big game hunters, and prosecution of hunters who cause accidents through carelessness, have been recommended to the Attorney General of Saskatchewan, Canada, by A. E. Etter, Commissioner of Game, according to a report to the American Game Association.

A new step in the efforts of game departments to stop hunters from shooting human beings by mistake for animals, the recommendation would require a thorough test of mental and shooting ability for everyone seeking a license to hunt in Saskatchewan. It would also place careless sportsmen liable to arrest on a charge of manslaughter in fatal cases.

With an increasing number of hunters in the field, many states have reported a large toll of hunting accident victims this season.

GAME RAISING AND FARM RELIEF

"Farm relief" may come from an entirely unexpected source as the central idea of the American Game Policy is put into effect, according to officials of the American Game Association. The idea is adequate compensation in some form to farmers and landowners who practice environmental control to increase game on their lands. And in widely scattered sections where it is being tried out, farmers are reaping returns in varying ways and amounts.

In Pennsylvania, according to the state game conservation commission, some farmers are making more money from selling hunting rights and by-products, such as board, eggs, butter, fresh meat and other farm products, than they do from their crops. Many farmers in Texas, who are actually producing game, are getting as high as $4 a day for hunting privileges.

There are four classes of game and game land, according to the classification of the policy, which advocates the landowner who practices game management be "compensated directly or indirectly for producing a game crop and for the privilege of harvesting it." These classes are "Farm Game, Forest and Range Game, Wilderness Game, and Migratory Game, which inhabits all classes of land."

"Compensation to landowners for the privilege of hunting may take the following forms," the policy points out—"Cash rental per acre, lease; cash payment per head of game killed, toll system; cash payment per man-day hunted, toll system; payment of part or all taxes on the land; service payment by hiring patrol to protect landowner's property; service payment by installing food, coverts, and refuges, and service payment by restocking game. Sportsmen are to make the payments according to the policy adopted recently by them at the Seventeenth American Game Conference."

GAME FISHES

TROUT HATCHING HAS WORRIES

There seems to be no end to the worries in the fish culture business in the State of California. With 28 fine trout hatcheries running almost the year around, the men in this department of the Division of Fish and Game are kept constantly on the "jump."

To the ordinary citizen, all that is necessary in the propagating of trout is to toss some eggs into a water trough, wait for the fish to hatch and then toss the young fingerlings into the rivers and lakes. But this is far from the case.

In the various hatcheries the temperatures must be watched very closely in order to keep the water from freezing and killing the fish, both young and old. A short time ago a large water line leading into a hatchery did start to freeze during a blizzard and fires had to be maintained along the line in order to save the valuable trout.

Rain storms and cloudbursts also create a constant threatening menace in the hatcheries along the rivers. Naturally, in order to maintain a constant flow of cold mountain water through the hatchery it is necessary to place the buildings down near the rivers. High water keeps all hands on the job night and day.

In regard to the hatching of the eggs and the raising of the trout to a planting size, so many technical points arise, which have been learned through years of investigation and experience, that the work is readily classed under a specialized art. Extreme care must be taken to prevent the introduction of disease into the hatching troughs.

Water temperatures must be equalized at all times. The current of water running through the troughs must be regulated. The young trout fry must be artificially fed after a certain stage of growth is reached.

And when the time for planting arrives, extreme care must be exercised in transferring the young, delicate fish from the rearing troughs to the fish cans. During transportation the fish cans must be constantly aerated and kept at a constant, cool temperature. When the stream is reached the fish must be slowly acclimatized or the shock of sudden temperature changes is liable to prove disastrous. Then there are many other points that must be watched while the fish are being released.

And this is just a quick summary, touching on a few of the high spots, of the worries attached to the propagating of trout for the mountain streams and lakes of California.

FISH CULTURE

The production of eggs from the brood stock at the Mount Shasta ponds has been very satisfactory this season. The eggs are of good quality. Shipments of Loch Leven trout and brown trout eyed eggs have been made to the other state hatcheries for hatching and rearing.

The egg-collecting station on Scott Creek in Santa Cruz County has been placed in operation for the collection of steelhead trout eggs.

The egg-collecting station on Prairie Creek in northern Humboldt County has been in operation for the collection of silver salmon and cutthroat trout eggs. This station will be continued in operation during the period of steelhead trout egg collections.

Construction work on the new hatchery in the Lake Almanor district has been completed. The foreman has moved his headquarters from the Clear Creek Hatchery to the new location. All hatchery work in this district will be concentrated at the new Lake Almanor Hatchery in the future.

Work on the reconstruction of the Kings River Hatchery and cottages is nearly completed. The hatchery building is ready to receive eggs for hatching, and the operating crew has now moved into the living quarters.

The egg-collecting stations on the Klamath River tributaries have been placed in operation preparatory to the collection of rainbow trout eggs.

MICHIGAN PLANTS TROUT

More than 12,000,000 trout were planted in Michigan's inland waters this fall by the Fish Division of the Department of Conservation. The trout planted ranged in size from fry to adults, but the majority were fingerlings, fed for several months in hatchery ponds and feeding stations. Of the tabulated 12,093,064 fish planted, 7,871,291 were brook trout, 2,660,875 were brown trout, and 1,508,798 were rainbows. Seventy-eight per cent of all the trout planted were hatched and fed at the various state hatcheries and 22 per cent were fed in feeding stations. The increasing progress of the Fish Division's "fingerling" program is shown in the fall trout planting report. Half of all the trout taken from feeding stations were six and seven months old. Many of these fish should be of legal length when the trout season opens in the spring.

CHARGE FOR FISHING

In this day of activity among conservation sportsmen, every mail produces some new and interesting idea on some phase of our fish and game work. The following appeared in the January issue of the *Sonoma County Sportsman:*

"There has been considerable indignation among the fishermen visiting the Russian River over the fact that some of the landowners have put up signs charging from $1 to $1.50 per car to fish in the river on their ranches. The landowner has a perfect right to charge for traveling and parking on his land, but it seems that if some of them want to make a few easy dollars, it would be better to be moderate in their demands. A fee of 50 cents for parking would not be begrudged by any fisherman and the rancher would be sure of a considerable amount of easy money from the fishermen, but to charge $1.50 for the privilege means that he will keep them off entirely.

"The ranch at the mouth of Maacama Creek charges 50 cents per car and he has a large number of cars there every day of the fishing season and enjoys the good will of all the fishermen. The time is rapidly approaching when the fisherman will have to pay to fish the most of the good holes of the river and it is up to the sportsmen to see that there are no hard feelings between the ranchers and the fishermen. A reasonable

charge would work no hardship on anyone and net the rancher a neat additional income during the fishing season."

IRRIGATION DITCHES DESTROY FISH IN MONTANA

It has been well said by Montana sportsmen that "irrigating ditches operated without fish wheels destroy more game fish in a year than it is possible to produce with a battery of hatcheries," according to the December issue of the *Montana Wild Life*. The fish run up the ditches from creeks and streams, become landlocked in extreme ends of ditches and die there to become fertilizer, rather than to thrill an enthusiastic angler. Experiments are constantly being carried on to perfect fish wheels with which to equip the openings of ditches. The United States Bureau of Fisheries has been struggling with the problem for years.

PROGRESS IN WISCONSIN

Rapid progress in all phases of the conservation program in Wisconsin has characterized the work of the State Conservation Commission during the past year, according to a bulletin from the Wisconsin Conservation Commission.

Among the accomplishments of the past year, and the State's greatest achievement in fisheries work, was the distribution last fall of approximately 90,000 adult brook trout, which was more than double the number distributed in 1929. Every one of these trout distributed will be large enough to catch next year and old enough to spawn this winter. This distribution was in addition to the more than 300,000,000 fish of various species, including all the fine food fishes native to the State which were propagated and distributed from the State's 25 hatcheries. One new hatchery was built last year at Bohner's Lake, and improvements including new raceways, rearing ponds, repairs to buildings, etc., were carried on at the other hatcheries.

Other fisheries work included the further development of rearing ponds in cooperation with interested individuals and sportsmen's groups; fish rescue work in the Mississippi River and at other places in the state including dams and flowages; the establishment of a large number of fish refuges throughout the State; the removal of rough fish both from the Winnebago waters and from northern lakes, and conducting a stream and lake survey which will aid in the scientific distribution of fish.

SIZE OF TROUT FLIES

The trout fisherman, that is the occasional or tourist angler, is all too prone to stock up with and use trout flies that are fine bass size. We do not intend to convey the thought that to catch bass buterfly size lures should be used; they should likewise be reasonable in size but larger than for trout. Watch your trout feed and in most instances the flies taken are not visible except in close range. You are not expected to match these mites in size but it is surprising how 14 or 16-size flies will raise a big trout when he will not notice a large fly. In virgin waters, where the anglers are occasional, trout will be less observing and often rise to anything in the way of a lure. A good angler I know uses small flies and chews off most of the wing to make

them more atractive, and his system works.—*Hunter-Trader-Trapper*, January, 1931.

INDOOR TROUT FISHING

It is with oddly mixed emotions that many anglers will read of the plan to provide an indoor trout-fishing pool for their convenience and recreation. The trout will be large and numerous, the water will be pent with conventional banks of greensward, and the fee will be no more than nominal. To such as seek the indoor fishing pool, the weather will always be mild and fair, a variety of perpetual June. They will find surcease there, and goodly fishes, and these will approximate, in eagerness for the hook, the trout of which all anglers have dreamed. It is a remarkable project, worthy of the lively fancy and commercial ingenuity of the times. Nevertheless, there are sundry traditional fixtures of the gentle art, as you might say, they will not anywhere encounter as you angle.

There won't be a grave and studious heron, motionless on the farther shore, like a Japanese carving or print. So motionless that life itself appears denied, and the gaunt bird to be as pithless and dry, and devitalized, as the gray arm of a drowned fir, weathered these twenty year and more. There won't be any heron. Of course, you can manage without herons, but in a way they are rather nice to have around when you are fishing.

And there can not be a cloud in the pool, in the smooth and secret mirror of the water. A cloud that has cast itself down from the migratory lanes of heaven to the still water that a cloud loves, and to which it is near of kin. A cloud, in all likelihood, that shapes itself slowly and softly, beyond analysis of the eye, to figures of fairie and of sorcery as it drifts across the pool where trout lie wakeful. An ephemeral, vagrant communion of fleeces, loitering slowly to northward, with a hawk wheeling against the whiteness of it. No, there cannot be a cloud in the pool. But one can get along somehow, without a cloud, though cloud, and water, and angler have been of a fellowship this very great while.

Nor can there be a kingfisher thrown past, as an arrow fares to its target, a gleaming bird with a fence-paling cry to shatter the silence. And we doubt that ever a wild woods rabbit will steal down to drink at the margin, tasting fear with the sweetness of the chill water. You will search in vain for the print of the deer's hooves, where the doe should stand and look across the water, her faun beside. And never, not ever, will a nameless brown bird, quite unafraid, yet restless as quicksilver, bathe at the brink of the pool. The trout will rise, but these will not be there.

And, of course, you must manage without the wind, the south wind—that bears an odor of the waking world, a quite wonderful and composite fragrance. The south wind, that has blessed the cheeks of fishermen these thousands of years, and has the hint and presage of rain in it, the certain clemency and imminence of rain. Such a wind, if it please you, as even the trout are aware of, in the windless depths of their residence. The first drop dimpling the surface, the whispering of the trees that greet the rain, the silver-fretted pool, the gladness of

the south wind and the rain. No, you cannot have the south wind. —*Yreka News,* December 31, 1930.

HOW TO STAIN YOUR RODS

The staining of a fishing rod is not such a difficult trick if you know how. Bamboo fiber is very dense and nonporous, so that ordinarily stains do not penetrate, and methods which are successful on wood do not work on cane. Many wood-staining methods require the wood to be treated with acids or strong alkalies, and even soaked for some time or boiled in them. Of course, such treatment won't do with a fishing rod. The most that can be done is to wipe off the rod with a moderately strong solution of lye, quickly killing it with vinegar, and then thoroughly washing with clear water. This serves to remove some of the natural resin and open up the pores to make it more receptive of the stain. However, a thorough scrubbing with Carbona is safer, and accomplishes almost the same results.

The methods given are with simple, harmless ingredients which can be obtained at any drug store or paint shop. Owing to the small amount of stains used, the utensils required are reduced to a minimum. A glass test tube will hold all the stain needed for any rod. An alcohol lamp will come in handy, but a can of Sterno or a gas jet or clean fire of some sort will do. A swab can be made by tying a piece of gauze or cheesecloth over a ball of cotton on the end of a stick. This works better than a brush. Owing to the varying characteristics of water in different parts of the country, distilled (or, if obtainable, rain) water should be used to insure uniform results.

There are three classes of stains used—aniline, mineral, and composition of mineral with vegetable. Directions under each head will be given. Of course, the rod must be prepared by scraping off the outer silex or skin and cleansing.—William B. Grant, January, 1931, *Outdoor Life.*

HELGRAMITES

A tough, dangerous looking bass bait is the helgramite. Anglers like to fish with this fellow, although few are enthusiastic about handling it. A vicious pair of nippers on the head, twin stickers on the tail, and an ability to turn, double and twist its many museled body about, advises care in hooking him on. Those who know look for a shell-like collar just behind the head and slip the hook under it. When so hooked a helgramite will live a long time and be active enough to attract the fish.

Helgramites have an interesting life cycle. He at different stages lives in the air, earth and water. For a period they live in the water, usually in riffles under stones. By holding a seine of fine mesh at the foot of a riffle and having a companion turn the stones above, the helgramites are carried by the current down into the net. Helgramites are also found in any sand beaches, along stones and logs. They leave the water and curl up in a sort of cavern. After a length of time the tough black skin is shed and then it is tender yellowish white and almost helpless. Now the helgramite grows a pair of gauze-like wings and eventually takes wing. They now fly around and are frequently found around street lights. The only resemblance they now bear to the water nymph is the same old nippers on the head. It is claimed that three years are required to complete this life cycle. Regardless of the time

required for these startling changes in appearance and life he is one strange creature and a dandy bass bait at any stage of it. The most fortunate fishermen hook him on a line without sinker and flip him around likely spots. An ideal combination is fly-rod, leader, helgramite and a bass pool.—*Hunter-Trader-Trapper,* January, 1931, p. 55.

FROZEN FISH

A short time ago a member of the department was asked if a fish would live after being frozen in the ice and if the Division ever froze game fish in blocks of ice for shipment to planting streams or lakes. The question was based on the claim that a horse trough containing several rough fish had frozen solid for a short period without apparent injury to the fish.

It is possible for rough fishes of small oxygen content, such as the catfish, carp, etc., to survive a partial freezing for a short time, according to J. H. Vogt, assistant to chief of the Bureau of Fish Culture, but the higher type game fishes, such as trouts are, would not live. There may be exceptions, he said, and the entire problem would depend upon the solidity of the ice, length of time of the freezing, whether there was partial or complete freezing in the vicinity of the fish, time of year, and many other technical points regarding the condition of the fish. The same rule applies to the eggs.

Casting aside the physical handicaps of the fish, the cost of shipment by such freezing methods would be prohibitive, Vogt said. To sustain ice plants at the hatcheries and handle the bulky material in the rugged mountains, not to mention the difficulties attending the refrigeration during long trips, would render such a method clumsy and useless.

ICE SMOTHERS FISH

Reports that fish by the thousands are being literally smothered by their own element after breathing the oxygen from lakes tightly covered with ice have resulted in the launching of an investigation in Michigan, according to information reaching the American Game Association.

The Institute for Fisheries Research at Ann Arbor has started a detailed study of the situation, following the discovery by the fish division of the Michigan Department of Conservation that large numbers of fish are dying in Rose Lake, Clinton County, presumably from lack of oxygen.

"Small lakes bottled up by ice all winter suffocate fish every year," the department announced. "But this is the first instance on record of serious loss in larger lakes. In small or shallow ponds the life-sustaining oxygen in the water is naturally depleted by the fish during the winter."

Low water levels, due to the drought of last summer and fall, are blamed by the Michigan department as the chief cause of the abnormal lowering of oxygen content in the lakes.

When the lakes fall low, with little interchange of fresh water through inlets and outlets, the sealing up process of the ice is complete. The fish live through most of the winter season under an air-tight lid of ice, as if in a tank. They gradually absorb the oxygen out of the water through their gills.

The fact that loss of fish, even in larger lakes, is already noticeable so early in the winter is considered by the department as serious enough to require an immediate remedy if disastrous depletion of fish-life in the inland lakes is to be averted.

STORMS HELP STEELHEAD

Although many reports have been made that steelhead fishing has been unsually heavy this year on the coastal rivers north of San Francisco, it is believed that the recent storm will prove to be a great help in protecting the fish.

Sportsmen have now turned their attentions to the fish runs. Reports show that anglers have crowded onto almost all the available fishing spots along the rivers during the past few week ends with the result that the toll on the fish has been great.

Many of the fish taken proved to be on their way to the spawning grounds and it was feared that a continuance of the practice would prove to be a severe handicap to the steelhead trout even though the limit is set at three per day.

Heavy rains throughout this section of the State have caused the streams to become clouded with mud and debris. This condition will not only put an end to the good fishing for the time being but it is believed that the fish will seek relief in clearer water. After the water clears later in the year the fish will again return and will proceed to the spawning grounds.

GOOD STEELHEAD RUN

Fishing season for steelhead and all trout, except golden and whitefish, closed in district 2½ on February 14th.

This district includes the territory along the coast line in Mendocino County and comprises some excellent fishing grounds.

From reports given out by various anglers the steelhead run has been unusually heavy this year. Just why this condition should exist is beyond explanation, although, as the country boy said, "guess it depends on what the fish think."

Considerable complaint has been made among sportsmen that certain unscrupulous anglers have resorted to the snagging method of catching steelhead. This method is very unsportsmanlike and cruel and every effort is being made to discourage the practice.

The snagging method consists of employing multihooked lines or poles in the narrow channels, hooking the fish in the side or stomach and pulling the catch ashore.

It has even been suggested by sportsmen that means be taken to close the rivers during the steelhead runs in order to prevent this practice of snagging fish.

A RECORD STRIPED BASS

A record striped bass for the year 1930 in the Napa region was caught on December 10th by Harry R. Ward of San Rafael, in the Napa Slough one mile north of Cuttings Wharf. The fish weighed 31¾ pounds and was 42 inches long and 10 inches wide. It put up a stiff battle and gave Ward some twenty-five minutes of thrills and excitement before it was brought to the net. Sardines were being used as bait at the time the striped warrior was hooked.

COMMERCIAL FISHERY NOTES

THE SARDINE SEASON OF 1930-1931

A fishing season is apt to be branded as either very good or a failure, and this judgment is usually based on a comparison with the preceding season only. The sardine pack at Monterey is said to have taken a terrible slump for the 1930–1931 season, but this means only that the paek fell short of the high record set in 1929–1930. Last winter's pack at Monterey compares very favorably with the results shown in the year preceding the 1929–1930 record catch, and when all the figures are available it will probably be found that the 1930–1931 pack exeeeded the average for the last five years.

The sardine pack for the San Pedro region came nearer being an actual failure during the early months of the 1930–1931 season, but the last two months of the season brought the catch up to a respectable total.

The layman, unfamiliar with the magnitude of the sardine industry, is astonished that the term "failure" could be applied to a canning season that yields thousands of tons of fish in one month.—W. L. S.

FALL AND WINTER FISHERY AT SAN PEDRO

The economie depression has been reflected in activities at the San Pedro fish markets, where business has been very unsatisfactory during the fall and winter months. That the 1930–1931 Mexican fishery for market fish, for example. has not been active this year is evident by the paucity of cabrillo landings and the entire absence of miseellaneous tropical species in the markets. At present (January, 1931), however, local fishing seems to be improving; the markets are being relatively heavily supplied with local fish and the number of idle men on the wharf seems to be diminishing.—L. A. W.

SPINY LOBSTERS SENT TO HAWAII

The California State Fisheries Laboratory, which often renders service to museums throughout the country, by providing specimens of California fish, sent some preserved California spiny lobsters recently for exhibition purposes to H. L. Kelly of the Fish and Game Commission of Hawaii.—L. A. W.

CESSATION OF TUNA FISHING

During December, 1930, and January, 1931, the packing of tuna practically ceased due to an agreement between the eanners of San Pedro and San Diego with the fishermen of both localities. This curtailment was made because of the over-supply of canned tuna on hand for which there was no market, due to the economic depression in the country. During the latter part of January, the purse-seiners and the big tuna eruisers were making preparations to resume fishing on February 1, 1931.—S. S. W.

SOUTHERN CALIFORNIA SARDINES

The first three months of the sardine season (1930–1931) in Southern California has shown a decrease in pack and less activity on the part of the canneries than in previous years. At the end of the third month, conditions improved somewhat.

During the month of November, the beginning of the present season, five canneries operated, three at Terminal Island, one at Long Beach, and one at Wilmington, while a plant at Hueneme began operations the latter part of November. During the first part of December no canning plants operated at Terminal Island, but the canneries at the three other localities continued operations. In the middle of December two Terminal Island plants resumed work. January saw these same canneries still in operation, and in addition another plant at Terminal Island and one at San Pedro began canning sardines. It is rumored that at least two more plants in Fish Harbor (Terminal Island) may soon join the active packing companies, which would make a total of eight plants canning sardines in Southern California.

During January many purse-seine crews, which have been idle since November, have been making preparations to join the Mexican tuna fishing fleet in February. It is probable that some of the sardine boats may desert sardine fishing and join the tuna fleet as tuna commands a higher price, in spite of the promise of increased activity on the part of the packing plants.

It is said that this apparent failure of the present sardine season is mainly due to the fact that most of the canneries have on hand a surplus of last year's sardine pack, which because of the economic slump, they are unable to sell; also there is a dearth of orders for this season's pack.—G. H. C.

SHARK-LIVER OIL EXCELS

Basking sharks are so plentiful at Monterey that fishermen have outfitted a boat to harpoon the creatures and bring them in for reduction purposes. In the past this industry has not been commercially profitable, because of the low prices paid by reduction plants, but the large number of sharks will enable the boat to pay much better than is ordinarily possible.

According to the Bureau of Commercial Fisheries, the oil from the liver of the shark is of very good quality. This is due to the type of food taken by the fish. An instance is recited where a very particular person was unwittingly given shark-liver oil on a salad and was unable to notice a difference from various other table oils.

Six of the big fish were caught during the last week in November, three of them by the crew of the *Two Brothers*. Previous to that time several of them had been noted in Monterey Bay, where they blundered into fishermen's nets while in pursuit of the microscopic marine life which they scoop into their capacious mouths and feed upon.

The sharks have been sent to the Monterey Fish By-Products Company, at Seaside, where, according to Max Schaeffer, they are reduced to meal for use as chicken feed, with the oil as a by-product.

Scientific study is now being made of this oil to ascertain its real qualities.

USE OF "FISH FLOUR" IN DIET IS PREDICTED*

For many years fish meal has been fed to domestic animals in Europe with excellent results. Not until recently, however, has the real value of fish meal in animal nutrition been appreciated in this country. There have been several reasons for this condition. One has been that, as long as a ready and profitable market existed for the use of dried fish scrap in fertilizers, not much incentive existed in the industry to improve methods of manufacture for the production of fish meals of good quality for animal feeding. Furthermore, the fish meal producers have never been organized for the betterment of their industry.

All other industries which produce materials suitable for use as animal feed concentrates are well organized in strong associations actively engaged in improving not only their finished products but the methods of marketing these products.

The excellent nutritive quality of fish and shellfish meals has been the principal factor in advancing their use in animal feeding. This has partially compensated for the lack of organization in this industry. If a strong and active association existed today among the fish meal producers, the fishery industries could not supply the demand for fish meal in this country alone.

Undoubtedly, considerable progress has been made in recent years in improving the quality of fish meals manufactured. But much remains yet to be done in this respect.

Fish meals not only have proven, by carefully controlled scientific feeding tests, to be good feedstuffs for farm animals, but their use in biscuits for dogs, cats and other domestic pets has made available to the fancier an excellent source of animal foods. These fish meal biscuits contain valuable protein and minerals.

In a few years fish flour for human consumption will be a valuable adjunct to our national diet. It will be particularly useful for good bone growth in children. Steps towards the introduction of this product have been made. These possibilities have not been realized fully in this country.

UNITED STATES-CANADA TREATY SOUGHT

A treaty between Canada and the United States to safeguard the valuable sockeye salmon fisheries of the Fraser River district is before the United States Senate for ratification. This treaty has been developed by officials representing the two countries, and has been endorsed by the American Fisheries Society, the International Association of Game, Fish and Conservation Commissioners, the Izaak Walton League of America, and many other groups.

"Failure on the part of the United States Senate to ratify the sockeye salmon treaty between the Dominion of Canada and the United States will mean the ruin of this $40,000,000 fisheries industry," states a bulletin of the Federated Industries of Washington, with headquarters at Seattle, to its members.

This proposed treaty provides for a joint commission to administer its provisions, to maintain joint hatcheries, and to prescribe the size of mesh and the kind of gear to be used in fishing for sockeye salmon.

* Manning, John Ruel, *The Fish and Oyster Reporter,* Vol. 12, No. 6, p. 14, December, 1930.

Some years ago a treaty developed in much the same way and covering the Great Lakes failed of ratification simply because the friends of conservation and the farsighted leaders in the fishing industry failed to do their part. The present deplorable situation in the Great Lakes is the result. It is hoped that all friends of conservation will get solidly behind the sockeye salmon treaty at once.

A RECORD CATCH OF SMELT

In the *Call-Bulletin* of December 15, 1930, appears a note to the effect that W. W. Boyd of Santa Cruz caught 500 smelt at one sitting in the San Lorenzo River. Boyd came to Santa Cruz in 1913 and ever since has been a devotee of the gentle art of angling. For the small smelts No. 14 or 16 hooks and 10-pound test leaders and snells were used. For Jack smelt No. 8, 10 or 12 hooks and 10 to 25-pound test leaders and snells are the thing. The smelt are "chummed" by using condemned canned sardines. Six or seven hooks are put on the same line. Worms for the smaller smelts and beef heart for the larger are the baits used. To quote Mr. Boyd: "Sometimes they are there and sometimes they are not; such is the fishing game. One of the chief factors involved is the ability to get the fish off the hooks, rebait and get the hooks back in the water in the shortest time possible while the fish are bunched up and biting. On the day of my good catch, December 15th, they just happened to be there. I started early and they patronized me, sometimes 1, sometimes as many as 5 at one time. I quit at 2.30 p.m. A reporter happened along and asked me how many I had. I told him 500. I had not counted them then but later when I did count them I found that there were 497."—Paul Bonnot, 510 Russ Building, San Francisco.

HOW TO PREVENT HALIBUT FROM DISCOLORING

A discovery of great benefit to the halibut fishing industry has been made by which discoloration of the fish can be prevented and the fish preserved for a longer period. The process is simple, consisting of the immersion of the fish for thirty minutes in a tank containing 25 per cent common salt. The discovery was made by Dr. Bedford and Peter Black, a University of British Columbia graduate. Both are attached to the Fish Experimental Station conducted by the Biological Board of Canada.

A difficulty that has faced halibut fishermen for years is that of discoloration. This process did not seriously impair the quality of the fish or its desirability as a food, but did render it useless for sale due to its appearance. It was found also that the fish did not keep as long after it became discolored. The immersion in the brine is not long enough to flavor the fish.—*Fishing Gazette,* December, 1930.

HEAVY HERRING RUN

Sea gulls in the San Francisco Bay district have been having a great feast during the past few weeks because of an unusual herring run. Hundreds of the birds, consisting of about four species, have been seen flocking all along the interbay coast line from Berkeley to Tormey near Vallejo.

And the sea gulls are not the only ones who have been doing extensive fishing. Many residents along the bay section have been gathering the fish by the basketful. It has not even been necessary to catch the members of the finny tribe in the orthodox fashion of hook and line and many cases have been noted where scoop nets and shovels were used.

Such a heavy run is not the usual course of events. Just what the cause may be is a matter for speculation but it possibly can be attributed to certain food stuffs that have been washed into the waters from the recent storms.

Observers declared that the herring have spawned on the rocks, grasses and other obstructions along the shoreline and that the gulls are greedily devouring the fish. Just how long the run will last is a matter of doubt.

It has even been reported at the Division that the fish have obstructed water pipes from many of the industrial plants along the bay and that the matter rose to the proportions of a nuisance in some cases.

Herring are not considered a popular fish in this section. In some countries such as Norway and Scotland they are prepared for economic use and are sought by the fishermen.

UPLAND GAME BIRDS

DISABLED VETERANS AND QUAIL

Disabled War Veterans at the Livermore Veterans Hospital are proving to the sportsmen of California every day that our native quail will thrive and multiply under the "sanctuary" system. The system referred to calls for the voluntary checkerboarding of the state with small quail refuges or sanctuaries for the purpose of giving the birds protection for breeding purposes.

About two years ago a number of veterans started to feed and protect a small covey, about 20 birds, of quail that sought refuge around the hospital grounds. Troublesome house cats were given the "bums rush" and hunters were instructed not to violate the sanctity of the grounds.

In a letter to the Division of Fish and Game the other day Veteran Maurice McCann announced that this small covey has now been increased to a flock of nearly 200 quail.

"They have become quite tame," McCann writes, "and each morning at 7 o'clock, and each evening at 5 o'clock the quail are all around here, just raising merry cain until we feed them—and then what a sight to behold! A prettier sight I have never seen and that alone is worth the care and feed we have given to them.

"Right now we use one sack of wheat every two months. Soon I expect the flock to be doubled and that will mean one sack of wheat each month. I am afraid we might have to call on some one to help us out because it will mean quite an expense to us. We will be more than willing to match every sack of wheat that is donated with another one bought from our own pockets."

There has been but one violation of the hunting rule in the "refuge" territory, according to the letter, and that was not a serious offense.

The government grounds consist of about 100 acres at this Livermore location and the work being done by the veterans in protecting our quail from extermination in the district is immeasurable.

Unfortunately the Division, because of its state-wide scope of action, is unable to furnish feed to the veterans. To make an exception here would mean to slight other worthy undertakings in the various districts. To attempt to assist all worthy causes would call for a sum of money far above our present powers of financial support.

Here is a fine chance for some private interest or sportsmen's organization to assist in a worthy cause. These quail will undoubtedly form the breeding basis for birds that will wander into the hills and become legitimate game later on, and sportsmen will do well to contribute a share of the wheat for feeding. A sack of wheat every month or so should not be too heavy a drain on the funds of a successful, private organization.

QUAIL REFUGES

The general campaign for wild life refuges has encouraged many states to launch extensive programs. One of the latest endeavors in this direction that has every prospect of producing fine results is the establishment of quail refuges of one hundred acres or more in Southern California at the instance of the Orange Belt Council of the Isaak Walton League.

The proposed plan includes a special central or fenced area in which breeding birds are to be confined under natural conditions and where food and water will be supplied at all times.

Young birds reared are to be released in the outer part of the refuges as soon as they are well able to fly, and there they will be given special attention in the way of feeding and protection.

The California Fish and Game Commission and the various water companies which own the land are cooperating in this venture, and the results will be watched with much interest.

QUAIL'S SPAN OF LIFE

Observations have seldom been made as to how long has a quail been known to live. One case is recorded, however, in which a quail with a leg band bearing the date of 1901 was shot in 1919. It then weighed 16 ounces on the druggist's scales.—*Montana Wild Life,* January, 1931.

PLANT QUAIL FEED

Sportsmen can be of great service to the quail in the matter of planting feed during the spring months of the year. Seeds planted now in the proper places will go a long way in solving difficult problems at a later date in the season.

Instead of being a laborious task the planting can be made the part of a pleasure hike during a week end. All that is necessary is to put several handfuls of seed in the pocket of the walking jacket for dissemination in the quail lands.

Walter Welch, captain of volunteer deputies of the Division of Fish and Game, announced that the following seeds are most acceptable for the purpose: hemp, rape and vetch. These seeds take the place of the ordinary weed seeds and furnish better food for the quail.

With the quail sanctuary system developed to such a fine standard, there are now more than 600 such quail refuges in the state, it should not be hard to find a suitable ground for the planting. Not only that, but the planter stands an excellent chance of gathering some very valuable, first-hand information on the habits of the birds.

The main fishing season does not open until next May and the hunting season in August, so there is plenty of time to perform this important duty. For further information on the subject, Welch announced that he would be glad to offer his services.

NEW QUAIL BULLETIN

"The Quail of California" is the name of a new bulletin just off the presses and ready for distribution by the Division of Fish and Game. It is designated as Game Bulletin No. 2.

This bulletin was written by Donald D. McLean, field naturalist for the division, and is one of the most complete bulletins ever issued on the subject.

In gathering material for the work McLean traveled to all parts of the state. Hours of patient waiting were required in many instances before the necessary data were secured.

Life history notes are made of the three main types of California quail—mountain quail, valley quail and desert or Gambel quail. An excellent account is given of various subspecies of this bird family. Diseases and parasites of the valley quail are also explained in the bulletin.

In estimating the speed at which the birds fly and walk, McLean spent hours racing quail with his automobile before he was able to make an accurate check. Many times the birds would not pursue a course parallel with the highway and the test would be a failure.

The work is written in an interesting style and can be readily understood by any person who is interested in our own native game bird. The writer also includes a paragraph on the introduction of Gambel or desert quail into other states.

QUAIL TAKEN IN SOUTH

Quail hunters took a heavy toll of the birds this year in southern California, according to A. W. Elder, field manager and assistant superintendent of the Yountville game farm.

He has just returned from a field trip to that section of the State and said that while no figures were available at this time indications pointed to an unusually hard season on the birds. Most of the shooting was done around the scattered waterholes, he said, and the birds had little chance to escape.

PHEASANTS IN WISCONSIN

During the past year the State game farm, located in Peninsula State Park, has been developed to the point where during 1930 there were 10,000 pheasants raised on the farm in addition to nearly 18,000 pheasant eggs distributed last May and June to cooperative groups throughout the State. This is more than double the production record of 1929.

PHEASANT CHASES CAT

Comes now the pheasant to join the rabbit, who, getting a sip of "cawn likker," spit in the bulldog's face; the worm, also imbibing of cawn, who strangled the big black bass to death—the pheasant was in a cornfield, too—

Whether fermenting corn in the shock had anything to do with this odd reversal of nature is not known.

The pheasant, according to game protectors, J. H. Noonan and R. J. Vickers, of the New York Conservation Department, was in a corn shock in a field on the banks of the Mohawk River near Albany, and saw a large Thomas cat stalking something in the grass.

That was too much for the cock pheasant. He charged through the long leaves of corn and bore down on the astonished cat. "Thomas" hightailed it away from there, vaulted into high grass and disappeared.

Again the tables were turned, for ordinarily the hunting house cat stalks pheasants and other birds, and, according to conservationists throughout the United States, takes an enormous toll of all small wild life.

MALE NOT WISE

Though the male of the pheasant species may be the stronger, he is not the wiser when it comes to facing blizzards according to Oscar Johnson, head of the South Dakota Conservation Department.

"The hen pheasant will tuck her head under her wing and run for shelter immediately," Mr. Johnson reported to the American Game Association. "But the cock pheasant will keep his head in the air and battle it out. As a result hundreds of pheasants have died this winter of frozen, ice-clogged mouths."

SPEAKING OF PARTRIDGES

August Bade, superintendent of the Yountville game farm, said: "The Hungarian, better known in Europe as the grey partridge, is considered by many sportsmen the best game bird of all. In the state of Washington a check showed that they multiply just twice as fast as pheasants or quail. Their broods, according to that check, averaged sixteen, while quail and pheasants could do no better than eight. These figures are for matured families and not the number hatched.

"The average nest of the Hungarian will contain at least twenty eggs and the larger percentage of matured birds from that hatching are due mostly to better care on the part of the parents. Very few birds show as much practical knowledge of how a family should be reared. Both parents have an equal share in the family life and this care and guidance continues until the family breaks up in the following spring for the mating season. At no time in the history of the family do they come together in flocks, but remain as separate family units. This practice leads to a wider distribution of the birds over any given area, as one family will battle another for the territory they have selected as their own. When this trait is understood it is easy to see why, with their more prolific production, they will populate a given area sooner than any other game bird.

SCHOOL CHILDREN FEED BIRDS

Arrangements have been made to feed thousands of game birds and song and insectivorous birds throughout the northern half of the United States. If nothing has been done to this end in your locality, now is the time to get busy.

In a number of states the conservation department, the conservation organizations, Boy Scouts, 4-H Clubs, schools, nature clubs, farmers and others cooperate on intensive winter feeding programs. Many flocks of ringneck pheasants, bobwhite quail, Hungarian partridges, and even wild turkeys are saved from starvation.

The small birds, the winter visitors, always fully repay any effort in their behalf. The school children in many instances build feeding shelters and supply food to their feathered friends daily. Boys and girls who feed the birds will become real conservationists. Encourage them all you can.

January, February and March are the critical months for the birds. If they do not receive help when the ground is covered with ice and snow they will starve. Plan now to help them!

FROM MISSOURI

A bulletin from the Missouri Game and Fish Department says that "Although the 1930 quail hunting season has closed, the responsibility of sportsmen, so far as winter feeding of birds is concerned, has not diminished. The department already has made plans and is ready to do extensive feeding in the case of emergencies such as prompted the conservation groups to distribute 88,000 pounds of feed last winter.

"While there is a scarcity of quail in some sections, it is believed that with proper feeding this winter and a good nesting season in the spring, a normal crop of quail next summer will result."

WINTER FEEDING IN MASSACHUSETTS

The league of Essex County Sportsmen's Clubs has attempted to stir up interest in winter feeding of game birds this winter should the weather demand it, and this feeding is to take a somewhat novel form. This organization has asked its affiliated organizations to get in touch with bakeries in their locality for the purpose of securing stale bread for emergency feed during periods of severe storms.

The requests appear to be meeting with cooperation and one department store which uses all of its stale bread from the bakery counters in the delicatessen department, has agreed to divert some of this should it be needed for use in winter feeding, and it is thought that clubs in other localities can obtain cooperation from their local bakeries and stores in the same manner.

NEWSPAPER PLEADS FOR COOPERATION

California hunters may find the timber country again stocked with wild turkeys if the Division of Fish and Game has proper cooperation from the people of the State. Experiments are being carried on at the Yountville game farm. The plan is to work out the best methods of wild turkey culture and attempt to stock the forest areas of California where turkeys once ranged in great flocks. It is now believed

that a few years of careful management will make this extraordinary game bird quite plentiful. The Division of Fish and Game is doing a wonderful work in its efforts to win back the State's once splendid reputation as a game country. Land owners and people generally should do everything possible to encourage the good work.—*Santa Rosa Press-Democrat,* December 16, 1930.

WILD TURKEY CAN COME BACK

Can the wild turkey, so numerous in the time of the pioneers and now rare or extinct in many states, stage a come-back on the transfigured face of America with the aid of the pioneers' descendants?

An experiment in southern Wisconsin seems to be proving the original Thanksgiving emblem may again strut in large numbers as "the noblest of American game birds."



FIG. 60. Young wild turkeys, huddled and wondering about the strange looking fellow who peers into a "black box." Photograph by E. S. Cheney, Yountville, 1930.

Against the advice of many authorities, who declared that the wild turkey could never reappear in the Middle West because of decreasing woodland areas, 40 of the birds were released a year ago near Baraboo, Wisconsin. They have thrived so well that the Columbia County Game Protective Association recently released 80 more birds in adjacent territory, Art Swanson, editor of the Outdoor column in the *Chicago American,* has informed the American Game Association.

"There are still many reasonable wild areas remaining and if it is possible to restrain the game hog Wisconsin may again enjoy the rare sport of hunting the wily 'turk,'" he declared.

The wild turkey formerly ranged every wooded state, so it is logical to believe this king of the game birds can be brought back by recreating a favorable environment through methods of protection and supervision which the science of conservation is now learning.

Thus it appears that science and civilization, after pushing the stately gobbler almost into oblivion may now be the forces to bring him back upon a greatly changed scene.

HINTS ON RAISING GROUSE

"Keep your feet on the ground" may be good advice for young men, but it is fatal to young ruffed grouse raised in captivity, a professor of Cornell University has discovered after ten years of research into the problem of how to save that vanishing game bird from extinction. Heretofore no way had been found to prevent the grouse from dying young when hatched in pens, because of their susceptibility to diseases to which poultry has developed immunity. But Prof. A. A. Allen, of the Cornell Laboratory of Ornithology, reported at the seventeenth American Game Conference that ruffed grouse can be raised if they are never allowed to set foot on the ground. He has successfully raised normal birds, he declared, by flooring the pens with meshed wire well above the ground for the birds to walk upon.—*The American Field,* December 13, 1930.

WATERFOWL

REFUGE DEVELOPED

Under the present program of development, California is destined to have a series of the finest waterfowl refuges in the country. One of the refuges, consisting of approximately 3000 acres, is situated in the San Joaquin Valley near the City of Los Banos.

The Division of Fish and Game obtained this excellent property in the year 1929 and immediately started work on a system of resting ponds for the birds. This location has always been considered the heart of the "duck lands" where birds migrate back and forth the year around.

The past hunting season has more than proven this land for refuge purposes. Ponds and waterways were left unbaited, in their natural condition, so that the birds would travel throughout the marshes in search of food and return to the protected property for rest.

Contrary to the opinions of many hunters, the ducks and geese did not remain within the refuge throughout the season and thus curtail the activities of the sportsman who wished to vary his regular diet with bird meat. Close check was made of conditions and it was learned that the present refuge system of resting ponds created more and varied flights throughout the season.

The geographic nature of the Los Banos refuge is rather deceptive. To the casual observer it would appear that there is a scarcity of water on the land for the intended purpose. This opinion will be quickly changed if one undertakes to walk in any direction over the property—ponds, waterways and canals soon put a stop to any direct course, that is, unless the walker decides to go for a swim or partake of a mud bath.

At present there are four main ponds or lakes, any one of which has a length of at least one-half mile. And that isn't all, workmen under the direction of A. D. McClellan, field man in charge of the refuge, are busy with tractor and scrapers, constructing levees and

ditches which will form other large ponds for the birds. The amount of improvements that can be accomplished are immeasurable and under the present constructive plan the Division will endeavor to make this refuge the finest waterfowl resting grounds in the west.

STUDY DUCK BREEDING AREAS

An investigation to discover the cause and extent of the decrease of wild ducks is being made by several hundred wildfowl observers in Canada, the native home of most of the ducks that spend the winter in the United States, according to a report from the Department of Interior at Ottawa.

Observations so far have substantiated claims expressed by experts that the shortage of wildfowl is largely due to destruction of their Canadian breeding grounds.

Settlement and agricultural development have curtailed the breeding areas, and when dry conditions prevail, shrinking the shallow lakes and marshes, the effect on the duck supply of the continent is marked.

A large share of the continent's duck supply is hatched in Manitoba, Saskatchewan and Alberta. Drainage and agriculture have destroyed thousands of acres of marshy prairie lands in the southern parts of these provinces, where the most important of the duck nesting grounds are found.

That the disappearance of satisfactory nesting spots in southern Canada will merely cause a retreat of the ducks to northern fastnesses is a forlorn hope, the department indicated. A comparative study of the ranges has proved that other sections are not suitable.

Seeking to remedy the situation threatening wild ducks, the department has enlisted the aid of observers in every section to report changes in the number of waterfowl and the causes.

DUCKS ON ICE

Bag limits seem to be the order of affairs in reports coming from the various duck shooting areas in the State. Reports also declare that sprig are by far the dominating figures hanging on the "string."

Hunters who were in the blinds early in January, in some localities, were given an extra run of sport for their money. It seems that many of the ponds were frozen over and the birds did a clownish, skidding act in attempting to make regular "three point" landings. No casualties were reported, although there were plenty of surprises.

And that prompts the advice, if you intend getting one or two more good shoots next season be sure and wear your heaviest "Yukon" clothes. The main factor in the hunting of ducks is to keep still in the blinds and a cold hunter is liable to shiver himself right out of a good shoot.

Great care should be taken in the handling of the gun because many a cold trigger finger has created a tragedy out of a sporting event.

HUNDREDS OF DUCKS BANDED IN CALIFORNIA

Duck banding operations on Lake Merritt as noted below in the following clipping from the Oakland (California) Tribune, emphasize

most strongly that migratory wild fowl are of interstate as well as international concern:

"In a report of the duck-banding operations on Lake Merritt since they were started under government auspices four years ago, Superintendent Lee Kerfoot of the park department cited today that 2,672 ducks have been banded by the bird-migration experts, and a total of 309 of these have been reported shot at various localities, proving that the Oakland ducks wander far between the regular winter seasons at Lake Merritt.

"Of the banded ducks which have been brought down, 115 were shot in the bay region, 32 at Pittsburg and Suisun, 22 in the Sacramento Valley, 11 in Colusa and Yolo counties, 21 in the San Joaquin Valley, and 18 in scattered California precincts. Aside from this State, the largest number of dead Oakland ducks is reported from Alaska and Canada, proving a definite north-and-south movement by the birds every year. There were 22 shot in Alaska and 25 in Alberta, Canada. There were also 6 shot in Saskatchewan and 2 in the northwest territory.

"The ducks that went east have been reported from widely scattered states, but they are greatly in the minority. One Oakland duck was shot in each of the following states: Oklahoma, Illinois, Nevada, Arkansas, Mexico and North Dakota. There were 7 shot in Oregon, 9 in Montana and 5 in Washington."

BLINDS SPACED BY LAW

The following synopsis was taken from the United States Daily, Washington, D. C., under the heading, "Maryland Game Law Upheld by Supreme Court."

It seems that a sportsman owned a small frontage of land on the Potomac River and erected a duck blind at a point within 250 yards of the dividing line of his land and that of adjoining owners on both the north and the south. Game wardens, acting pursuant to the statutes, destroyed the blind as being an illegal structure; and threatened to destroy any other blind which might be erected under like conditions.

To enjoin such action the owner brought suit against the wardens in a State court. He conceded that the State has power to prohibit altogether the erection of blinds or to regulate their erreetion and maintenance. His sole claim is that the statute violates the equality clause of the Fourteenth Amendment, because it discriminates in favor of riparian owners with a frontage of more than 500 yards; and also because it does not apply uniformly to all the waters of the State. The hearing was on bill and answer. The trial court dismissed the bill on the merits. Its decree was affirmed by the highest court of the State.

Mr. Justice Brandeis delivered the opinion of the court.

"The game laws of Maryland provide for granting annual licenses for the erection and maintenance of duck blinds in the waters of the State. No blind may be placed at a greater distance from the natural shore than 300 yards; and blinds must be at least 500 yards apart. A preferential right to select the position for a blind is conferred upon the riparian owner; but he may not place a blind 'within 250 yards of the dividing line of any property owned by him and the adjoining property bordering on said waters * * * unless with the consent of

the adjoining landowner'." For certain waters the limitations prescribed are different from those above stated. In some, permission to erect a blind is wholly denied. For others, existing licenses are made renewable without condition.

No fact is shown on which to base the contention that the State's power of classification has been exercised unreasonably. The purpose of the legislation is, as the court found, "the conservation of waterfowl and the protection and safety of those engaged in shooting them."

At the present writing we have no laws in California relative to the above material, although the subject is well worth serious thought and discussion.

DIVERGENT VIEWS

Below are quoted views of three well known men in the general conservation movement—Taken from the January issue of *The Auk*.

"The sportsmen must realize more fully that the title to all wild life in this country is legally held by the State and that because of this all people have a stake in its welfare. All people should be ready and willing to aid, at least through taxation, in policing these natural resources, leaving to sportsmen their numerical restoration and artificial production — game restoration programs in other words." — John Phillips, Naturalist and Sportsman.

"Today in some states, and Massachusetts is a notable example, the appropriation to administer all the wild life of the State (excepting the marine fisheries) is based almost entirely on the revenues from licenses sold to the fishermen, hunters and trappers.

"The inconsistency of this theory lies in the fact that in effect it is asking a limited group which exploits only a limited portion of the wild life of the State to supply the funds to administer all the wild life. It is quite safe to say that at least sixty per cent of the total volume of wild life in any state, includes the song, insectivorous and non-game birds and the quadrupeds which are not classed as game or fur-bearers. It is quite safe to say that the protection of and increase in this sixty per cent is of greater interest and importance to all the rest of our people than to the group known collectively as the sportsmen—who today are supplying the funds to administer it. Wild life administration in any state will never be adequately financed until the appropriating powers clearly perceive this situation and appropriate sums greatly in excess of the revenues provided by this special group." Wm. C. Adams, Director, Division of Fisheries and Game of Massachusetts.

"Wild water-fowl in this country have recently passed through two very adverse breeding seasons and their numbers are less today than during the life time of any one present. Drainage has taken from them at least one hundred million acres of lake, pond and marshland, thus reducing their breeding and feeding ranges. Hunters increase every year. More wardens are needed to prevent illegal shooting which is rampant in many sections. Sanctuary areas for wild fowl are pitifully small when compared with the vast needs that exist. Where is the necessary money to come from to correct this situation? Probably not more than one person in sixty shoots ducks or geese. Will the fifty-nine agree to be taxed to supply field sport for the one? Should the hunters not bear the extra expense which now is so urgently needed, and will they do it?"

"As to the means of raising this money, he said, a tax on shot-gun shells has been suggested. "A tax of one cent on each shell would produce about eight million dollars annually which could be spent for game preservation in addition to the hunter's license fee already required. It is the gasoline tax paid by people who use the roads that largely keeps up the public highways of the nation."—Dr. T. Gilbert Pearson, National Association of Audubon Societies.

HERONS EXTEND RANGE

White herons, which really are immature little blue herons, were seen last summer in various sections of Wisconsin. The presence of these birds here is quite unusual, as their normal range is farther south, according to the State's conservation director, Paul D. Kelleter. He is of the opinion that the birds were forced north by the drought lower down. Herons are protected by Federal law.

MAMMALS

HOW TO TAG A WHALE

Labeling live whales in the Antarctic will be the strange occupation of Lieutenant C. A. Milward, chief officer of the British Royal research ship, *William Scorsby,* which recently set sail from London for the south. Milward's work is an important feature of the investigations now being conducted to study the habits of the whale, its distribution and migrations, and thus to aid in conserving the industry.

After the whale is sighted, a careful approach is made until the boat is close enough to shoot a dart into the huge mammal. The darts contain dates, locations and other necessary information for study purposes.

The League of Nations is making a study of the whaling industry with a view to proposing methods of conservation. One of their suggestions is that gunners and crews of whaling vessels shall be paid in accordance with the amount and quality of the oil secured, rather than upon the number of whales killed. This is expected to eliminate an inducement to indiscriminate slaughter which has been an undesirable feature of the industry in the past.

DEER TOO PLENTIFUL

The station agent's troubles in "Pigs Is Pigs" were nothing compared to the vicissitudes being heaped upon officials by the disconcertingly prolific increase of deer in the Kaibab National Forest of Arizona.

After a strenuous hunting season and months of frantic efforts of the officials to trap and ship away as many of the deer as possible, experts recently announced the vexing prophecy that the herd will be larger this spring than it was before the control "fireworks" started in the fall.

The deer are still believed to number from 5000 to 10,000 too many for the food supply in the forest, Walter G. Mann, forest supervisor,

has informed the American Game Association. The herd totals approximately 23,000, after the removal of 5000 last year.

When converted into a national forest in 1905 on Theodore Roosevelt's recommendation, the remote Kaibab Plateau near the Utah boundary contained comparatively few deer. But under protection the animals increased so rapidly that in 1925 they swarmed the forest 30,000 strong and were found to be destroying plant life and starving by the thousands every winter. This slaughter by nature stirred the nation and resulted in immediate steps to reduce the herd.

But so far hunting seasons, official marksmen, trapping and distribution to other sections have failed to cope with the increase as effectively as the situation has demanded. Hunters have believed the spot inaccessible and the deer too numerous for good sport. Trapping has been difficult, shipping too expensive. The largest reduction has been due to starvation.

While in most parts of the country deer are scarce, officials of the Kaibab are seeking every legitimate means for disposing of some of theirs, Mr. Mann said.

ANTELOPE SANCTUARIES

With the fast disappearing prong-horned antelope apparently in need of a "little home in the west," the New York Zoological Society has appealed to the United States government by resolution for a million-acre antelope preserve—equivalent to 40 acres apiece—in which these last members of once great herds can increase.

"The antelope has been reduced by thoughtless slaughter and increasingly unnatural conditions to a few thousand specimens, and will be the next large American animal to disappear outside of sanctuaries," declared Dr. W. Reid Blair, director of the Bronx Zoo. "At the present their numbers are estimated from 16,000 to 26,000, and I am inclined to think the lower figure is more nearly correct. Now is our last chance to establish a suitable home for this most characteristic of American mammals."

TEXAS MAN SAVES DOOMED ANIMALS

During the month of December a story appeared in the Fresno (California) Bee which gives an interesting account of a Texas banker who has a hobby for perpetuating various species of animals that seem doomed for extermination. The story, bearing the date line, Kerrville, December 20, is as follows:

On a 2000-acre ranch near here, Louis A. Schreiner, local banker, has made a home for native American animals that are rapidly becoming extinct.

On Schreiner's ranch are numerous longhorn steers, native cattle of the Southwest which were so prominent fifty years ago, and which have fast disappeared from that territory. The banker's ranch is also a haven for buffaloes, elk, antelope, wild turkeys, rabbits and quail, all of which are decreasing steadily and are faced with eventual extinction.

Schreiner's hobby is preserving the lives of animals whose races are doomed to extinction. He has collected them for only a year, although he has had the idea and the ranch for five or six years.

He first started his collection with longhorns. He enlisted the aid of his friends and by picking out cattle as they were on the way to market, they soon had eighteen head.

Now, in addition to his eighteen longhorns, Schreiner has sixteen antelope, two elk, five buffaloes and numerous wild turkeys. Rabbits and quail were the only inhabitants of the 2000 acres before he took them over.

The antelope were shipped in from Canada, through the help of Claude Hudspeth, Congressman, from El Paso, and the buffaloes and elk were obtained from game commissioners at national parks.

It's no little work for Schreiner to keep these animals. Although natural provisions are plentiful, care must be taken that they keep in good health, because, being of such few numbers, the death of a few would make a big hole in his herds.

A river which winds its way through the 2000 acres provides drink for the animals, and in the winter they are fed oats and hay.

Three game wardens are busy on the ranch at all times to protect the various animals from strangers who might mistake the banker's hobby for a hunter's paradise.

Schreiner works in his bank all day long, and at the end of the day, when the key has turned in the last lock at the bank for the night, he climbs into his car and drives to the enclosures, where his horse is saddled and waiting.

Each evening at twilight he rides the range, seeking out the familiar shapes of animals. As there are many caves and hideouts, his evening trips are sometimes unsuccessful. Some of the animals, as the elk and antelope, will run up to him as he rides by. These he often feeds from his hand.

MOOSE-ELK IN MONTANA

Known to U. S. forest rangers as "the elk with the funny horns," the first known specimen of a cross between a moose and an elk was recently killed in the Deerlodge National Forest, Montana. The rangers had for the past five years known of this animal that associated with and grazed like an elk, yet whose horns and body were half moose and half elk. He was first seen on the Boulder Creek District of Deerlodge Forest in 1925, when he appeared to be about a three-year-old. He was finally killed in Bear Gulch, Jefferson County, Montana, and weighed 1100 pounds.

WOMEN SHOOT BISON IN ARIZONA

Two women recently won trophies in one of the most exclusive of all sports, bison hunting.

Since the disappearance of the great buffalo herds which used to blacken the Kansas prairies, buffalo or bison hunting has become practically an extinct sport, and few present-day big-game hunters can point to a buffalo head among their trophies.

Arizona, however, manages to keep the old tradition alive, for intelligent conservation work has kept a good-sized herd in its natural state on the Kaibab Plateau. So rapidly has the herd grown in recent years that it has now become necessary for the State Game Commission to authorize an annual hunt in order that the herd shall not outrun its own food supply.

Ten hunters made up this year's hunting party, and two women, Mrs. J. G. Tarbell of Phoenix, and Mrs. Emma K. Haynie of Tuscon, shot one bison each, as did the other members of the party.

GRIZZLY BEAR IS MILD MANNERED

The grizzly bear is not the ferocious animal seeking whom he may devour, as has been generally supposed, but is a mild mannered animal, and peaceful toward man unless unduly provoked, according to Milton Skinner, noted civil engineer and naturalist who addressed the Kiwanis Club today at the weekly luncheon held at the Peden Cafe.

The speaker, whose name appears in "Who's Who" and who is the author of many books on animal life related to the members of the club and their guests personal experiences had with the grizzly in the fastness of the Montana mountains.

The speaker stated that one of the chief attributes of the grizzly is his watchfulness, and that he is the only animal that carefully watches his back trail, not only for a short time, but also seems to remember for days what has happened. He stated that there is nothing more difficult than to attempt to follow and come up upon a grizzly by following his trail.

He told of a personal experience of following a bear for five days, without having seen him but twice, and all attempts to cut across and come up with him proved futile as the animal seemed to have a "hunch" of the purpose of a pursuer.

Naturalists, the speaker declared, place the bear in fourth place below man in intelligence. First comes the dog, then the horse, the wild Asiatic elephant is third and the bear fourth. This intelligence was illustrated by the speaker by incidents of how grizzles had avoided traps set for them in every conceivable manner without being caught.

The grizzly, he declared, does not attack man unprovoked or in fact any other large animal. He loves tainted meat but allows other animals to kill it for him.

The speaker related many interesting personal experiences which illustrated the curiosity of the grizzly, and also to show that he will not attack a man unless provoked.

He said a huge grizzly stood for several minutes within 10 or 12 feet of him raising on its rear legs and looking down on him with evident curiosity.

The bear he said is one of the strongest and bravest animals known, and the great State of California has done well in choosing the animal as its emblem.—*Hanford Sentinel*, December 17, 1930.

HORSE DISEASE UNDER CONTROL

The disease, diagnosed as *encephalomyelitis* or Borna disease, which attacked horses throughout the San Joaquin Valley during the past few months is reported by practicing veterinarians to be subsiding in the central and southern parts of the valley. In cooperation with the Hooper Foundation of Medical Research and the Division of Veterinary Science of the University of California, department veterinarians have concentrated their efforts on controlling this outbreak and the situation now seems to be well in hand.

It is noted in the January issue of CALIFORNIA FISH AND GAME that nearly 700 horses were known to have been affected with this disease. The sickness is comparable to infantile paralysis among humans, and was recognized in the United States as early as 1847.

SNOW AND LIONS

While snows from the storms will undoubtedly create a certain hardship on the workers at the various trout hatcheries in the State. such winter conditions prove a great aid to hunters of lions.

Regardless of weather and adverse conditions the work at the hatcheries in the high mountain reaches must be performed to prevent the loss of thousands of fish and eggs. Snow shoes, skiis and snow shovels are very much in evidence in some localities and the workers generally heave a sigh of relief when the warm spring weather sets in. On the other hand, the lion hunter finds trailing difficulties very much improved by a layer of snow on the ground. Not that well trained dogs can not follow a trail in dry weather, but a layer of snow on the ground enables the hunter to pick up the telltale marks more quickly and thus hasten the work.

Often a mountain lion will cross and recross its trail many times while wandering around in search of food and such actions will slow the hunt while the dogs are locating the lead-out trail. With snow on the ground, the hunter can glance around, locate the line trail immediately, summon his dogs and proceed without delay.

Jay Bruce, lion hunter for the Division, said that he can train young pups to hunt lions without the assistance of experienced dogs when there is several inches of snow on the ground. The hunter can trail the lion until it is frightened from its bedding place, he said, then the young dogs should be turned loose on the fresh tracks and urged to pursue the chase. There is less danger of the dogs becoming confused or lost by deer or other tracks. Once the dog has learned the scent from the lion track it can be trained to hunt no other animal.

SHOE A LA CARTE

At last a real economic value has been found for old, cast off shoes. They make good coyote feed.

This may sound like a ridiculous statement but it is the truth, nevertheless, and the late Mr. Don Coyote has offered up his stomach as proof of the assertion. Perhaps an explanation is in order.

It seems that the deputies are making a close study on what some of these alleged marauders are supposed to eat. Any animal or bird, now in bad graces with the game loving public, that happens to get especially inquisitive around the various game districts is certainly flirting with a ticket to unknown places.

Now that there are so many quail sanctuaries established throughout the State the campaign has been especially rigid. Of course, the mountain lion is not included in this class because he is hunted the year around by State lion men and it is not necessary to ascertain the source of his food—any deer hunter can tell you about that.

But to get back to the coyote question, the old shoe discovery was made the other day in the office of the Division of Fish and Game at San Francisco by Donald D. McLean, field naturalist. A deputy had killed a coyote and, according to instructions, shipped the stomach and contents to the office.

A thorough investigation revealed that the stomach contained a large per cent of various kinds of rodent fur and bones. There was also a varied assortment of chicken feathers and rabbit fur. But the real climax came when McLean uncovered a chunk of cloth lining from a shoe and a large, shriveled section of leather. No evidence of game birds was found in this fellow.

WAR ON HOUSE CAT

Now is a good time to start a real war on semi-wild domestic cats that slink unmolested in our field and game ranges. These animals are multiplying fast in some districts and unless cooperative action is taken a real menace is in the offing.

Cats prove to be a severe hindrance to the farmer because they prey upon the birds that help to destroy insect pests. In a granary where mice are apt to cause considerable damage the cat has a place, but when allowed to wander into the fields and brushes the feline quickly deserts his domestic duties for the more exciting pleasure of catching birds.

By catching the mother quail, who is extremely loyal to her nest eggs, the cat virtually destroys a whole covey of birds at one stroke of the paw. It is estimated that thousands of quail are destroyed every year in this manner. Quail nesting will not start until late in the spring or early in the summer and now would be a good time to route the cat population without disturbing the nesting birds.

GLOVES FOR RABBITS

Rabbit hunters must be extremely careful at this time of year because "rabbit disease" is very prevalent. The disease has never been found in domestic rabbits but is apparently confined to the ranks of the wild varieties.

The organism of "rabbit disease" or tularemia was first isolated from ground squirrels in Tulare county during plague studies conducted by McCoy and Chapin from 1909 to 1911. This disease is spread from animal to animal through the bite of the rabbit tick, the wood tick and a species of fly.

Tularemia is transmitted to human beings through the handling of an infected animal or by the bite of the infected insect. The disease is contracted easily through abrasions of the skin. Many cases have been

contracted by rubbing the face or the eyes with the hands which have been contaminated through contact with the infected rabbit.

As the rabbit season is open in all districts except 4–¾ during December many inquiries are coming to the Division of Fish and Game relative to the rabbit situation. Holiday season is the time when many persons get a chance to go into the hills with a gun, and it is the time when most care must be taken to prevent the spreading of the disease.

In cooperation with the California Department of Public Health, the Division of Fish and Game issues the following simple rules to guard against human infection: Do not handle wild rabbits with the bare hands—rubber gloves should always be used when dressing this game. Do not handle wild rabbits which have been found dead or which have been brought in by a dog or cat. And sportsmen should shoot rabbits on the run, as those animals which are sluggish in their actions are likely to be infected with tularemia.

The meat of wild rabbits is absolutely harmless if thoroughly cooked. Most of the danger lies in the hunting and skinning processes.

Tularemia is generally introduced with a low fever, which persists for two or three weeks. This is accompanied by a profound prostration, followed by a long, slow convalescence. The onset often begins with a severe chill and with influenza-like symptoms. In many cases an ulcer develops at the site of infection, together with a marked enlargement of the glands that drain the ulcer.

Expert advice should be sought in all cases which may be suspicious of this disease. However, if proper precaution is taken it need not be necessary to spoil any persons holiday outing.

A NEST OF THE CALIFORNIA GRAY SQUIRREL (SCIURUS GRISEUS)

The big bushy-tailed gray squirrel of the coast belt of middle and Northern California is a common resident of the mixed forests of redwood, Douglas spruce, tan-oak, the colorful madrone, and the tree of spicy fragrance variously called laurel, bay, or pepperwood (genus *Umbellularia*). In the forests of Marin, Sonoma and Mendocino counties their large leafy nests are common in oaks and less plentiful in Douglas spruce and other trees.

A nest collected by me on my place at Lagunitas in Marin County on June 23, 1925, was among the topmost branches of a living tan-oak (*Quercus densiflora*) about 45 feet from the ground. With its outer covering of leaf-bearing twigs of the tan-oak, neatly bitten off and rather loosely attached, it formed an irregular mass about 2 feet in diameter and 3 in height. Inside of this protecting mass of twigs and leaves was the nest, a roughly subglobular structure 11 by 14 inches in diameter, consisting wholly of bark of the redwood tree (*Sequoia sempervirens*). The outer and coarser part, torn from the branches and often bearing patches of tree lichen, consisted of thin strips a foot or two in length, varying from a quarter of an inch to a full inch in width at the broad end but soon torn into slender thin streamers, many of which were again subdivided.

Within this outer covering was the living chamber, a cavity little more than five inches in diameter, consisting of and lined with finely shredded inner bark of the redwood, the shreds as fine as the finest grass and intermixed with a soft compact felting of the same material.

The lower part of this felting forms a base or platform approximately 9 by 11 inches in diameter and an inch in thickness, supporting the inner chamber and forming a substantial vestibule on which the mother and young may rest.

Thus the nest may be described as consisting of four parts:

1. A rough outer covering of oak leaves and twigs.
2. The nest proper, of long strips of redwood bark.
3. The inner chamber of finely divided inner redwood bark.
4. The felted base extending as a vestibule, also of finely divided and compacted redwood bark.—By C. Hart Merriam, *Journal of Mammalogy,* Vol. 11, p. 494, 1 pl. Nov. 1930.

RAT PROBLEMS

Elimination of "dead" spaces in building construction is one of the most important items in the battle against the versatile rat. These common rodents have been the bane of man for centuries, not only because of the destruction heaped on human foods, but also because of the ability of the animals to transport disease germs from house to house, land to land, and continent to continent. Many men have devoted their lives to a study of methods of rat control, and as a result countless preparations, devices, and contrivances are constantly being made available.

Farmers' Bulletin No. 1638, issued by the United States Department of Agriculture, deals with the rat problem in a very practical way. The issue is headed "Rat Proofing Buildings and Premises," and there are twenty-five pages of written material and illustrations designed to give the reader a good clear outline of the work.

The rat question has more to do with our conservation work than one would naturally suppose. No doubt many of our game birds, not to speak of domestic fowls, suffer from the depredations of these clever rodents. It is also an established fact that the plague, then raging in Hongkong, China, was introduced into California in 1896 by infected rats; the unloading of a sugar boat in the Sacramento river brought with it the introduction of plague into the ground squirrels of this coast. Practically every year since, we have had cases of plague, both in man and animal, in the rural population along this coast.

The above is but an instance recited to show the extreme dangers encountered in allowing the rat to thrive unmolested. Certainly any work or publication that is devised to hamper the activities of the rat is worthy of close scrutiny and practical application.

MISCELLANEOUS

FLIGHT OF BIRDS

We are more or less interested in the flight of birds. This interest is first manifest in the human race with the primary development of sight in the cradle, and its mystery follows us through life unto the grave. It is probably reasonable to believe that many of our ground animals are also possessed with a wonder about the skill of birds in flight, and, in truth, the subject could be built up to one of universal proportions. The following valuable material was taken from an account entitled "Aeronautics of Bird Flight" which was prepared by Sterling Bunnell, for the magazine *The Condor*. Unfortunately space does not permit us to reproduce the entire story, and the reader is much the loser thereby:

"So familiar are we with the flight of birds that we have lapsed into the habit of thinking it beyond our comprehension and so have let it go at that. By thinking, however, in terms of aerodynamics derived from aviation the maneuvers of birds may be readily understood. Therefore, if we start with the simpler problem of learning to fly an airplane, the way in which birds fly will be unfolded to us. The airplane motor and propeller furnish the forward speed, and the uplift is provided by the wings acting on the rush of air caused by the speed of the plane. The wings are slightly tipped in a forward and backward direction so their under surfaces face slightly forward. This angle with the horizontal is called the incidence and, together with the wing area and speed, gives the plane the lift. In flight the support given by the air pressure is firm and ample, but should the plane slow down to stalling speed it will immediately fall. Should the motor stop, the pilot merely noses his plane downward until it glides downhill and so maintains the all-necessary speed which furnishes the air pressure that acts on the wings and supports the plane. Thus, if a plane is one mile high the pilot can safely glide ten miles to a landing field.

"Mysteries of soaring flight. First let us solve that oft debated problem, 'How does a bird fly without flapping its wings?' We have all stood on the upper deck of a ferryboat while a sea gull but an arm's length away remained beautifully poised on motionless wings keeping up with the boat even in the presence of a stiff side wind. There may be fifty of them at once, all with motionless wings and all keeping steadily abreast of the moving boat. Should one but glance out from the other side of the boat the mystery will be solved, for here all the gulls are flapping their wings. As the wind strikes the side of the boat it shoots up over it and down again on the other side. The motionless gulls are riding the updraft while the flapping gulls are working their passage in the downdraft. As a gull is light and has plenty of wing area, an efficient wing curve and low resistance, his gliding angle is very low compared with the one-to-ten of a plane. He does not require much of an updraft to allow him to remain level with the boat while he is really gliding downward in his relation to the air. With a very low gliding angle a bird in still air would descend quite slowly. If the

speed of an updraft exceeds this speed of the bird's descent when gliding, it is apparent that when gliding in such an updraft the bird can execute maneuvers and can even ascend without ever flapping his wings.

"Man uses this principle in his glider, which is a very light motorless plane with a low gliding angle. A range of mountains is selected against which the wind blows constantly, and by utilizing the updraft so produced, man has remained aloft in a glider as long as fifteen hours.

"Once while on a hilly seacoast fronting to the north and with a north wind blowing, a long line of pelicans came along the coast in my direction, sailing very low and with motionless wings. On they came, undulating up and down with the rolling contours of the gullies and ridges, and to my surprise passed directly over my head although I was in plain sight. They had found an upshoot of air fringing along those hills and preferred, even in the face of danger, to travel without effort along this rather than to leave it and be required to flap their wings.

"On a ridge of hills stretching along the Pacific Ocean I had often noticed an abundance of large hawks and marveled at this because here where the weather was too bleak for small animals to thrive the food of these birds was scarce. Finally it dawned on me that the hawks lived there because they were lazy. The constant stiff breeze from the ocean against the hills furnished them by its updraft effortless transportation throughout their domain.

"Once on a still, cold, foggy morning while deer hunting in the mountains we came upon several dozen turkey buzzards in a canyon grouped on the branches of a tall dead tree. It was suggested that some hunter must have killed a doe, but this was not the correct explanation. The breast muscles of a buzzard are small and the wing area tremendous, so the effort in flapping such wings is fatiguing. As there was not a breath of wind to aid them that morning they preferred to roost. The wing muscles, which in fact constitute the breasts, are small in all soaring birds, so in the buzzard they are not sufficiently powerful to flap the wings for long. Later, a breeze sprang up and straightway the buzzards deserted their tree and scattered over the ridges where they were to be seen circling, but invariably on the windward sides of the ridges. Whenever one was seen to leave such a location of updraft he was observed to busily flap his long wings until he reached another upward current on the windward side of some ridge or peak, where again he could sail about in leisure. Putting this to practical use the direction of the wind may be told by observing on which side of the peak the buzzards sail.

"Still later this same morning the fog lifted and the sun shone hot. By 10 o'clock wavering atmospheric lines of heat bordered objects of the landscape and then it was that the turkey buzzards were seen to sail widely over the canyons irrespective of the upshoots of wind against the hills. Everywhere, in response to the sunshine, columns of heated air were rising and the air became soarable. These updrafts of heated air were amply sufficient in speed for the buzzard with his low gliding angle to sail about in them and even to gain in altitude. Such updrafts, due to heat, which are familiar enough to pilots, make one when flying over a heated valley bump in and out of one rising column after another, with the feeling of jolting along in a vehicle over a rough corduroy road.

"Sea gulls invade the city of San Francisco as mendicants from the bay, seeking donations of food. Flocks of them on warm, still days are often seen circling over certain spots in the city, where air is heated by reflection from pavement and walls of buildings and protected from winds. Here with motionless wings they sail 'round and 'round, flapping their wings only when sailing away from the location. Sensitive as they are to air currents they have found an updraft of heated air in which flying is but easy gliding, so there they collect. The updraft is shown by the smoke from the many chimneys, which ascends rapidly where the gulls are sailing and does not do so where the gulls are compelled to flap their wings.

"The above examples illustrate that birds soar by means of updrafts, caused from either wind influenced by the shape of the terrain or from convection currents of heated air."—*The Condor,* Volume XXXII, No. 6, pp. 269-271, November-December, 1930.

GAME IN SOUTHERN CALIFORNIA

In a report for December, 1930, received from Captain Ed Ober of Big Pine, he reports conditions in District 4½ as follows:

"The month closed with very few ducks in the country. What shooting there was could best be spoken of as being around Bridgeport and Grants Lake, Hot Creek, Upper Owens River, Mono County.

Valley quail shooting was just fair compared with former years in Inyo County, and practically no quail shooting was enjoyed in Mono County. A few limits of mountain quail were brought in from the Sierra foothills west of Inyo sections.

Deer are exceptionally plentiful all along the lower foothills, both in Inyo and Mono counties, due to no snow and the wonderful fine weather conditions.

Quite a number of sagehens have been left, particularly around the Bridgeport and Bodie country, also around the Long Valley sections, all in Mono County. In Inyo County a few birds have been spared around the Coyote Valley Flats, west of Big Pine at the elevation of nine and ten thousand feet, also a few left around the Winnon Creek and Dead Horse Meadows, northeast of Big Pine.

Mountain sheep have been watering all summer at the various springs around the Deep Springs country, twenty miles west of Big Pine."

CARE OF THE SPORTING DOG'S NOSE

Artificial heat and lack of ventilation are bad for the setter, pointer and hound or for any dog who uses his nose for his master's sport and recreation. It is much better that he have a deep nest of straw or hay right out of doors even in severest winter weather. But there should be plenty and it should not be allowed to mat or pack down or break up. If in a close kennel the condensations of the dog's breath may after a few days get the bedding straw damp. So change it often if you keep him closely housed.

There is another matter affecting a sporting dog's scenting power and that is the feeding of hot food. Personally, I doubt that a dog "smells" a track as we "smell." There is probably something quite different from an odor that he detects but, however he does it, the organs are obviously in his nostrils or air passages.

Hot food, even only mildly so, is distinctly not good for him or his throat and many a good dog has gone wrong because master or mistress thought hot pancakes or hot mush or hot soup was good for him and Sport was too hungry to wait for it to cool.—*National Sportsman*, March, 1931.

MONTANA—INCREASED LICENSE FEE

Members of the Butte Gun Club, one of the largest organizations of sportsmen who enjoy the thrill of shooting shotguns and rifles as well as the joy of the out of doors, have passed a resolution unanimously favoring an increase in the prevailing hunting license fees now charged in Montana, and with this resolution have offered suggestions of rare importance. Forty clubs of sportsmen in Montana have already taken similar action. The Butte Anglers' Club with a membership of more than 2000, recently gave complete indorsement to the proposed increase in full realization of the fact that additional revenue is required if the campaign of conservation is to proceed without interruption in the State.

MICHIGAN SPENDS $12,000,000

Michigan's 400,000 small game and deer hunters spend about twelve million dollars while in the field during the hunting season. They have approximately ten million dollars invested in guns and other more or less durable hunting equipment. This equipment has an annual depreciation volume of about one million dollars and an interest charge of a half million if it is considered as invested capital. An additional $5,000,000 is spent each year for sundries, if the computation of the Department of Conservation is accurate.

Included in the twelve millions spent while in the field is a gasoline bill of $500,000, one hundred thousand of which is gas tax paid into state and county highway funds.

Michigan's army of hunters also pays the state a total of $600,000 in license fees. The ratio of license fees to the other costs of hunting is $1 to $18.50.

The license fees paid the state become a part of the Game Protection Fund which is administered by the Conservation Department for the protection and propagation of game.

"GHOST WARDENS"

With a neat little trick of applied psychology, game wardens can now shoot a deadly bolt of fear across a whole range of mountains and paralyze a game hog in the very act of snaking an illegal brook trout out of a secluded pool.

Walter B. Sellmer, formerly of the California Fish and Game Patrol, discovered how to do it. His method peopled the forests of his districts with a whole army of ghostly "Game Warden Sellmers," always ready to step out from behind a tree and tap a poacher on the shoulder.

Captain Sellmer discovered long ago that a game warden ought to be in a hundred places at once to keep an eye on gamehogs who spoil outdoor sport for real sportsmen. So he invented signs which put an imaginary "Game Warden Sellmer" behind every rock and

tree, and thereby multiplied himself and his effectiveness a hundredfold.

Now the spoil-sportsman who sneaks far up a mountain brook and plans to catch a mess of illegal trout was likely to find a sign like this staring at him across the pool:

"GAME WARDEN SELLMER WILL BE HERE TODAY—He Might Be Watching You Right Now."

And bang! goes the peace and contentment which made for happy fishing. Or the hunter who happens to sight the finest buck he ever saw, a few days after the deer season, finds his trigger finger shaking after a signboard at his elbow has nudged him and asked:

"Is Game Warden Sellmer Watching You Now?"

The fact that Game Warden Sellmer may be 20 miles away, prosecuting a poacher, doesn't soothe the jumpy nerves of the gamehog who finds the woods and streams dotted with other signs which say, "This Stream is Patrolled Daily by Game Warden Sellmer," or "Game Warden Sellmer Has a Temporary Camp 180 Yards Ahead."

The plan works, says Captain Sellmer, for the feeling that a thousand eyes are watching every violation of the game laws is not conducive to confidence. It pays to advertise, he thinks.

PLANES AND AUTOS FOR POACHERS

The poacher, like his cousin the bootlegger, has gone modern.

Time was when the poacher was a simple fellow who occasionally bagged one of the squire's rabbits for his supper. But the modern poacher or game hog is often so prosperous that he rides to his work in airplanes, automobiles or high-powered speedboats, which help him to increase both the amount of his slaughter and the difficulty of catching him, according to officials of the American Game Protective Association.

The recent annual report of Paul G. Redington, chief of the United States Bureau of Biological Survey, declared that strengthening of the enforcement arm of the law is vitally needed to cope with this new type of poacher or game hog.

The increasing use of the automobile, airplane and speedboat by poachers and wealthy "spoil sportsmen," Mr. Redington said, enables them to reach and leave the hunting grounds before they can be apprehended, and assists them in such illicit practices as market shooting, night shooting and the snaring of ducks.

Although the vast majority of hunters are sportsmen in every sense of the word, the few who are game hogs and preseason hunters are as dangerous to game as the market hunter, who kills not for the sport but for profit. It is this class principally which makes the automobile and the airplane a major menace to the preservation of the country's game birds and animals by providing quick access to secluded hunting grounds, and a means of removing illegal game unapprehended.

WISCONSIN GAME LAWS ENFORCED

The past year was by far the most successful in the history of the law enforcement division of the Wisconsin Conservation Commission. Although the fiscal year upon which records are based ended on July

1st, the figures for the year which ended last July 1 indicate the success of the law enforcement division. Conservation wardens throughout the state made 2085 arrests, an increase of more than 500 over the previous year. By the work of the wardens last year the state school fund was enriched by $71,960 from fines imposed upon game law violators. A total of 11,551 days in jail was imposed upon violators in lieu of fines.

While the number of arrests made by officers should not be the sole criterion of the efficiency of the force, it is the most obvious way to gauge its efficiency. Educational work was carried on by the wardens throughout the state last year as the policy of the commission in regard to law enforcement is to prevent violation rather than to merely punish violators.

The foregoing are but a few of the achievements of the Wisconsin Conservation Commission during 1930. These were selected because they are indicative of trends of policy followed by the commission.

The conservation commission feels that it is laying a firm and broad foundation upon which may be builded in the future a real conservation program. Essential to such a program, however, is a favorable public sentiment toward it. With favorable public opinion which will insure adequate funds, and with judicious expenditure of that money by competent men, there is no limit to the success Wisconsin can make in conservation.

HUNTING ACCIDENTS IN PENNSYLVANIA

The number of hunting accidents increased somewhat during the deer season, which brings the score (with three days' reports still to be tabulated) to 49 fatal and 230 nonfatal accidents, according to a bulletin from the Pennsylvania Game Commission. The score of fatalities, so far, is under that of last year, when 53 persons were killed and 210 nonfatal accidents occurred. Contrary to belief, most accidents (at least 85 per cent of them) occurred during the small game season through careless use of the shotgun.

HUNTING ACCIDENTS IN NEW YORK

New York is the first state to report a compilation of its 1930 hunting season fatalities showing that eighty-seven hunters were killed or injured during the season in the Empire State.

Of this number, 28 were killed and 59 injured. As is usually the case, the majority of these accidents were self-inflicted. The 1930 figure is approximately the same as the figures for 1927 to 1929 inclusive.

Several other states have published preliminary hunting accident figures, some of them quite appalling, showing a reckless abandonment that must be curbed if the fields and forests are to be made reasonably safe for those who follow the chase.

The several state game departments must take a most determined stand and go the limit in helping to curb such criminal negligence.

SPARROWS STRUCK BY LIGHTNING

A freak trick caused by lightning resulted in the sudden annihilation of 85 English sparrows at Talladega, Alabama, during the past summer, according to the Department of Game and Fisheries.

During an electrical storm a bolt of lightning struck a large magnolia tree in the front yard of the home of Otis Parks of North street, causing no apparent damage to the tree, but resulting in the death of the birds.

Small boys who gathered up the dead sparrows and counted them, declared that many had lost their heads and others "eyes had popped out."

PASSENGER PIGEON

Occasionally the report is circulated that someone has observed what is believed to be a member of the supposedly extinct passenger pigeon species *(Ectopistes migratorius)*. A latest account comes in a recent issue of the Missouri Fish and Game News. The report says that Ernest Schwarz, taxidermist and wild life exhibitor for the Missouri Game and Fish Department, saw what he believed to be three of the birds near Highway 63, ten miles south of Jefferson City.

Continuing, the account reads: "While he does not claim to have rediscovered the bird, he believes it possible that *Ectopistes migratorius,* last observed in Missouri in 1880, was the bird seen. Because it is possible that the passenger pigeon is yet in existence state conservation officials are urging that pigeons and doves be left unmolested. * * *

"Owing to the fact that a flock of domesticated pigeons were nearby he had an opportunity to compare the two species of birds although he had no field glass to make identification positive. The bird, however, answered the general description of the passenger pigeon and the hope that they might be positively identified as such was heightened by observing them in flight and seeing them alight in a tree. * * *

"The passenger pigeon once was so numerous in Missouri that they were killed by thousands and wagon loads of them were dumped in the refuse heaps in St. Louis as late as 1878 because they went unsold at one cent each."

DIVISION ACTIVITIES

BUREAU OF FISH CULTURE

Owing to the extremely difficult and complex nature of this work it is almost impossible to give a fair outline of fish culture activities in the space allotted here. To give the proper attention to the subject it would be necessary to occupy the space on many pages and this periodical, with all other activities to cover, does not permit such liberty. So in reviewing a few of the facts the reader should bear the above idea in mind.

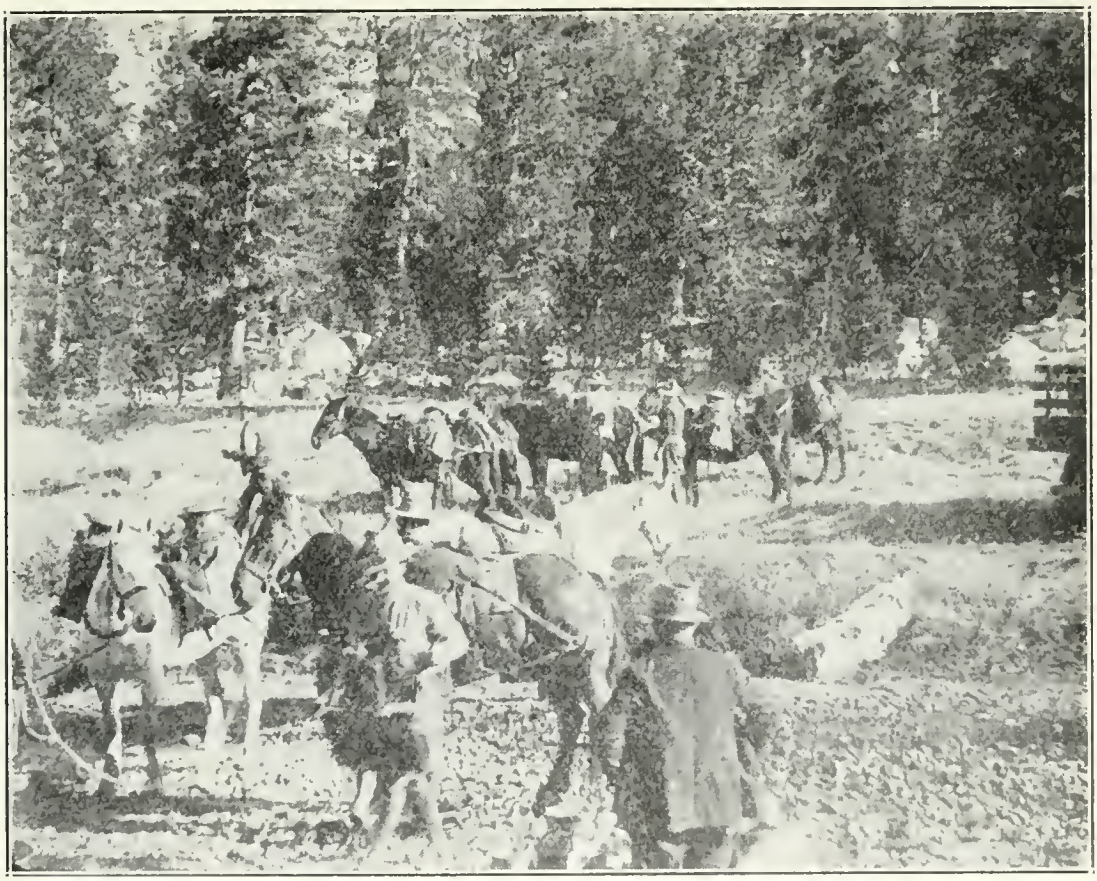


FIG. 61. Fish planting party in the Sierra Nevada mountains near the Yosemite Valley. In planting the remote streams it is often necessary to transfer the fish cans from trucks to the backs of pack horses. This picture was clipped from one of the Division's educational motion picture films. Photograph by E. S. Cheney, 1930.

After a careful tabulation it is estimated that the total number of eggs and fish shipped and planted, also fish on hand, for the season of 1930 amounted to 40,400,794. The trouts include Loch Leven, German brown, eastern brook, steelhead, rainbow, black spotted, large lake, golden and cutthroat. Other fishes include quinnat, silver and Atlantic salmon and grayling.

Biological work, including a hydrographic chart and contour map, on a large scale, of the bottom of Donner Lake has been completed by

George A. Coleman, and will be used as a basis for future study. Studies were also made of conditions in the Salton Sea area.

During the month of January a study was made of conditions at a number of Los Angeles county lakes and reservoirs, where bass and bluegill, taken from Chatsworth reservoir, were planted.

Weather reports show that drought has prevailed generally throughout the State with the exception of San Diego County, where the rainfall is believed to be normal to date.

Lake Tahoe has not filled to the brim, standing at 6224 feet, approximately. The light fall of snow on headwaters of the tributaries is not calculated to raise the level of the lake to any considerable extent.

Owing to the low water in the tributaries of the Klamath River, an egg-collecting station was installed in the Scott River below the mouth

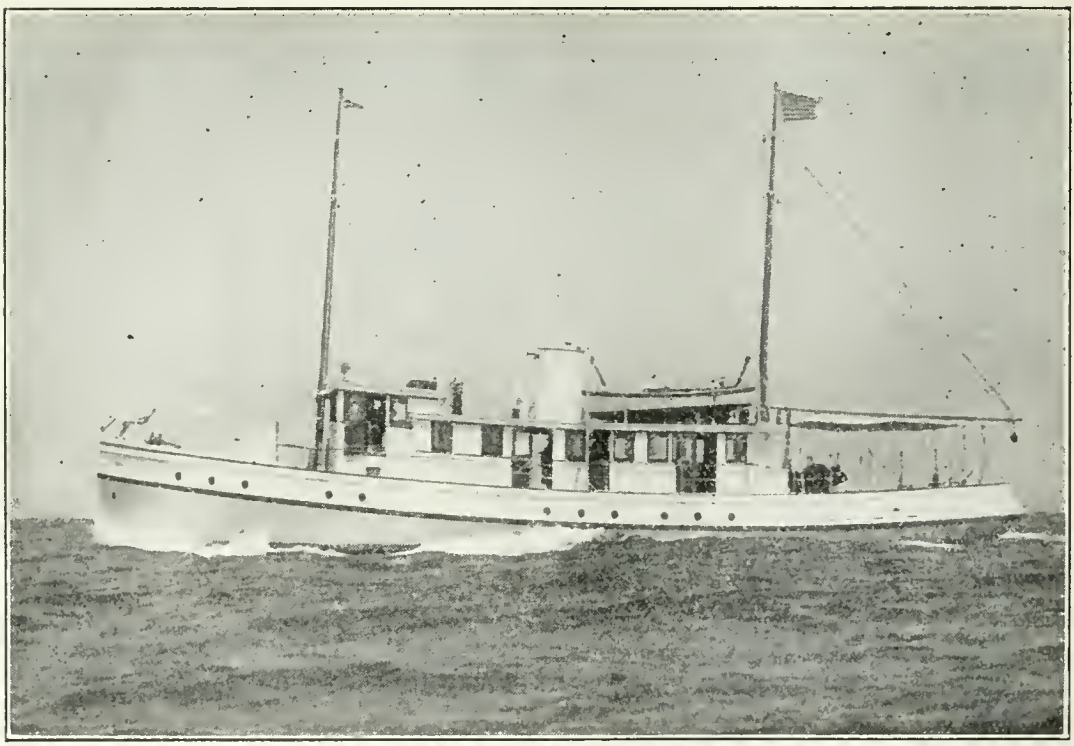


FIG. 62. Patrol boat *Bluefin* heading for the open sea. This boat is not only used for patrol duty but serves the commercial fisheries laboratory in making scientific study of various marine life. Photograph submitted by N. B. Scofield, September, 1930.

of Shackleford Creek Station; during season of normal rainfall this would be impractical owing to the high state of the water in Scott River.

The Eel River is so low that the fish will not ascend to the egg-collecting station at Snow Mountain or Cape Horn Dam.

Lake Almanor is very low. The same condition exists in all tributaries leading to the lake.

There is enough water in the North Fork of the Feather River for the fish to ascend but too low for them to make any effort to reach the spawning grounds in Warner Creek or the upper reaches of the North Fork.

The streams are all very low in Humboldt County. Very few fish are ascending the Eel River at this writing. Redwood Creek and

Prairie Creek are so low that very few steelhead are ascending these streams.

Thus it can be readily seen that a shortage of water is a great problem at this time and will probably regulate the class of streams in which plants are made at a future date. However, it is hoped that by the time this reaches issue late rains will bolster up a serious situation.

BUREAU OF COMMERCIAL FISHERIES

Probably one of the greatest works that is being developed in this Department is the punch card system for tabulating the catch records of the fishing boats. As a preliminary to the installation of the system it was necessary to provide a simple system of code numbers for boats. The complicated custom house numbers have become so confused as to be of small value in determining the identity of a fishing boat. It was therefore necessary to give each boat a simple serial number. This was done by attaching a number plate to the pilot house. Actual work of attaching number plates started on February 19 at San Pedro.

During the months of December, January and February, approximately 44,219 tons of sardines were received at the fishing ports of Monterey and Pittsburg. For a like period the year before the total amounted to 74,346 tons thus showing considerable drop in quantity. In southern California there were approximately 22,456 tons of sardines received and this figure showed a loss in comparison with the previous season.

The patrol boats *Bluefin* and *Albacore* underwent drydock repairs which consisted of scraping, painting and other mechanical workings. The *Bluefin* was engaged in hydrobiological survey work at Monterey, during times when not on patrol duty.

Both of the boats have been kept very busy patroling the coast and seeing that California fishing laws are obeyed. The *Albacore* has kept a very close watch on the floating reduction plant, *Lake Miraflores*, which is said to be operating in the open sea.

The market price of lobsters at San Diego has been the lowest for many years and, as a result, limits were being placed on the amount being brought here from Mexico. We have not, at this writing, been able to determine whether this low price is due to local increase in abundance or to good fishing weather; it is probably the latter. The season closed on March 1.

Three additional bulletins were recently completed at the State Fisheries Laboratory on Terminal Island, and include: No. 32, "Boat Catch Analysis of Southern Halibut," by G. H. Clark; No. 33, "Boat Catch Analysis of Bluefin Tuna," by S. S. Whitehead, and No. 34, "Salmon Investigations," by Dr. J. O. Snyder.

BUREAU OF EDUCATION AND RESEARCH

It is extremely difficult to outline the various duties and problems that come under the jurisdiction of this department and there seems to be no table of gradations that will offer a suitable list in rank of importance. For instance, deer damage may be the predominating issue on the files today, while tomorrow the scope of interest may be shifted to duck disease or fair exhibits or some other factor that has been thrust to the top.

Probably one of the outstanding works at the present time is the inauguration of a complete waterfowl census of nesting birds in California, and a census of the black brant from San Diego to Humboldt Bay. This excellent work is being done under the guidance of James Moffitt, who is one of the most thorough waterfowl students in the State. Deductions from the findings is calculated to offer a good solid basis for future waterfowl conservation work.

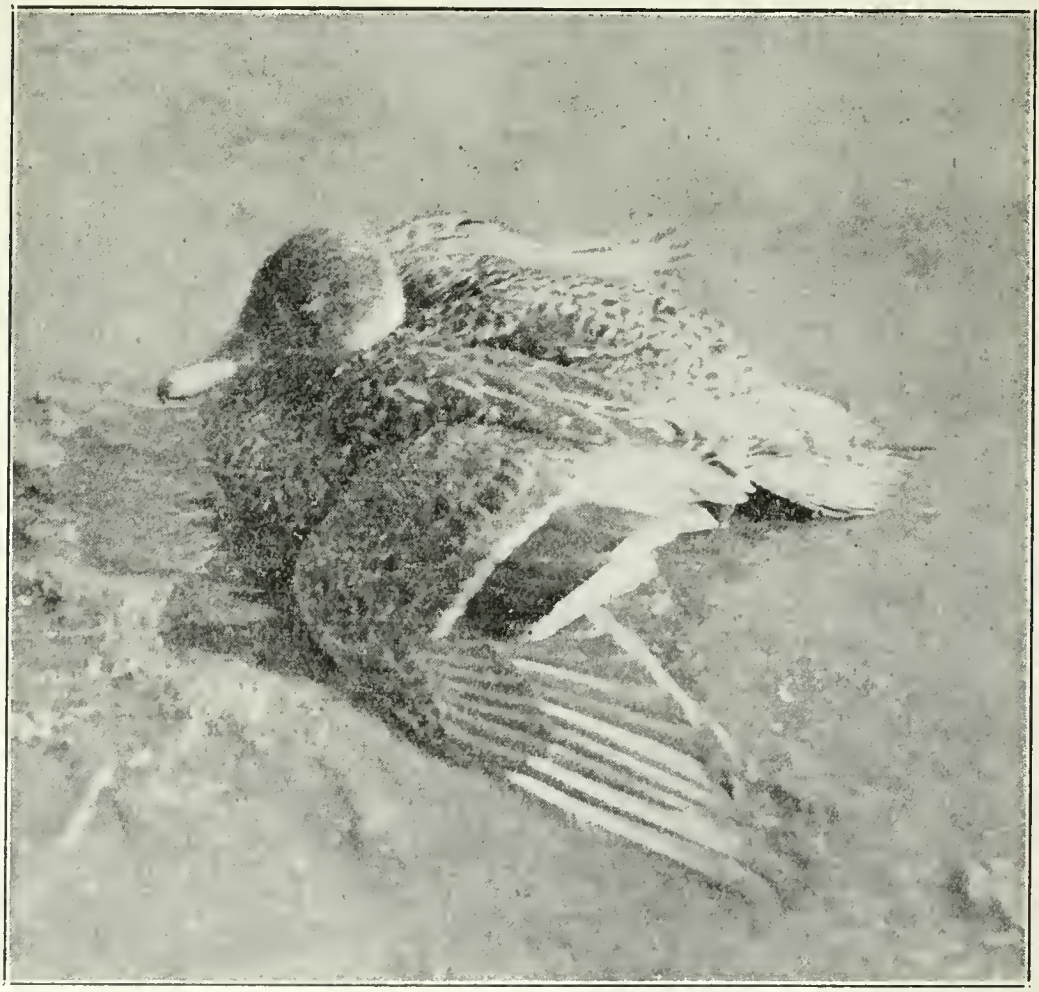


FIG. 63. Diseased duck photographed at Tule Lake. Duck disease is one of the major problems confronting the Bureau of Education and Research. The division maintains a staff at the G. W. Hooper Foundation of Medical Research to fight the constant menace of sickness to our wild life. Photograph by E. S. Cheney, November, 1929.

Research work on the various problems dealing with game damage, disease and control measures is being carried on in regular steps in all parts of the State and in conjunction with the G. W. Hooper Foundation of Medical Research. The bureau is working hand in hand with the U. S. Bureau of Biological Survey and other organizations so designed for the work.

The visual education branch of the bureau is also showing fine progress in presenting programs and lectures before schools, colleges, clubs, fraternal organizations and through numerous other mediums. E. S. Cheney, department photographer, has recently added several excellent films to the list of those available for public use. The new reels give an invaluable history of bighorn sheep in California while

another film shows just what sort of progress is being made in developing the State waterfowl refuge at Los Banos.

In response to a request from the University of Illinois, certain reels from our film library were shipped to Urbana, Illinois, for the purpose of studying California fish and game work. The association proved to be a successful and instructive one and Acting Director Leo K. Wilson received a very encouraging letter from Professor Henry B. Ward, of the Zoology Department of the University of Illinois, telling of the success of the venture. An invitation was extended to visit the middlewestern university and to show California pictures and lecture on the subject.

A complete inventory is being made of the library in the San Francisco office. This work is carried on under the direction of Mrs. Bessie W. Kibbe, librarian, with the assistance of Mrs. Mae Byrnes. As there are thousands of pamphlets on hand, the detail attached to this inventory has created a work that calls for care and patience; when completed it will be of excellent service in gathering scientific material for study.



FIG. 64. Look, look, look at the ducks. These birds are settling on the resting ponds at the Los Banos waterfowl refuge after long flights in search of food. Photograph by E. S. Cheney, January, 1930.

BUREAU OF GAME REFUGES

The constant, steady encroachment of civilization is making the work of this Department more complex and exceedingly important as time advances. It is easy to understand that without a place to live and to hide, there can be no game or game birds. The history of our

vanishing wild life in California is the best proof of the need of well selected refuges.

The past duck shortage in the country has, of course, centered a great deal of interest on this phase of the hunting program. Fortunately the State has secured 3000 acres of the finest duck grounds in the West near the City of Los Banos, in the San Joaquin Valley, and has made rapid strides in developing this accession during the past year. The past few months has witnessed a large amount of work with men and tractor, in an effort to increase the number of large duck ponds and to provide roads and means for complete patroling of the property. An observation platform has been erected in the center of the property which not only will allow a quick survey for poachers but will afford fine opportunity to study the bird population as desired. The securing of additional areas in other parts of the State is well under way.

In developing waterfowl refuges it is not the aim to feed or bait the birds and thus prevent their migrations for sustenance. On the other hand, the refuges are designed to act as resting places where the birds can find relief from constant hunting. A survey made during the past season proved that there was almost a constant flight to and from the refuge as the birds sought either food or shelter. Without such a protection it has been proven that birds will scatter and leave the district entirely instead of gathering in protected ponds and recovering from the demoralizing experience.

Mountain lion hunters who are protecting the deer and other game animals in our mountain refuges have been as active as possible. Although the winter has been noticeably light in the entire State the hunting bag showed a slight decrease; this is attributed to a possible diminution in the ranks of the animals. During the year of 1930 there were 292 claims made for lion bounties, as against 325 the year before. In the three months from December to February, inclusive, there were 109 lions taken, according to official record. Jay C. Bruce, veteran State hunter, was in the lead for animals killed.

Trapping reports are coming in very slowly. The reports received indicate that prices have not been very high. It is believed that many trappers are holding their furs for a higher market. Many complaints have been received from trappers of injury to fur bearing mammals on account of poison; fur bearers are reported scarce in most sections of the State.

In order to improve certain phases of our work it was decided to transfer D. D. McLean, field naturalist, from the Bureau of Education and Research to this Department. Directors of the bureaus involved believe that this change will broaden the fields of both works and add greatly to the cooperative activities at hand.

BUREAU OF FINANCE

In order to provide sportsmen with the proper credentials during the last fifteen days of the duck hunting season in January, the 1931 series of hunting licenses were issued and distributed in the month of December. A new series of angling licenses were also issued at this time. These were distributed, as well as possible, to all reliable agencies in the State.



FIG. 65. Almost everyone's imagination is intrigued by mysteries that involve life and death. Here are the heads and feet of two does that were left by a mysterious lawbreaker along a side road near San Diego. The nature of the find leads deputies to believe that these members were left for some diabolical reason. Photograph by Lee Passmore, January, 1931.

From a checkup of deer tags sold in the 1929 season, it is revealed that about 4000 more hunters pursued this game during the past season than on the previous year. The principal species of game, other than deer, are doves, quail and ducks. The total sale of deer tag licenses for the past season is $123,999 and this is an increase of $8,527 over the year 1928; this is the largest sale of tags since the law went into effect.

In reviewing financial statements it is learned that the total amount of all license sales and miscellaneous collections for the eight months period from July 1, 1930, to February 28, this year, is $1,139,816.91. As the month of February is an "off" season in the realm of fish and game sports, there were practically no hunting and angling license sales recorded.

In view of the fact that the country as a whole has suffered materially from various sorts of business depression, it can be said that the division has more than held its own in a financial way. Affairs compare quite favorably with previous seasons and unless there is a severe drought or other unavoidable misfortunes this coming year, there should be a fair increase in all activities.

BUREAU OF PATROL

Work in this department is progressing steadily with the idea of obtaining the greatest amount of efficiency from a limited force of field deputies.

Any national disturbance that effects the nation also has its bearing on our field sports, and, despite the great business depression, little difficulty has been experienced in working the force to full capacity. Due to the extremely large territory to cover—1000 miles of coast line, more than 10,000 lakes, about 150,000 miles of automobile road, hatcheries, game farms, etc.—there is always plenty of work to do the year around.

During the three months from December to February, inclusive, 588 arrests were made for violations of our fish and game laws. These arrests brought fines that totaled $17,895; this total shows a small decrease when compared to the previous year, but when one considers all items there is little doubt but what the patroling forces are more than keeping up with the growing difficulties. The violations, as usual, run the gauntlet from the killing of swans to the shooting of elk.

Unusual problems are constantly developing. As an example, a mystery arose in the San Diego territory over the finding of the heads and feet of two does along a lonely side road. Deputy Webb Toms made an investigation of the case and found that the remains of the animals were discovered by a woman who was riding horseback; the horse shied at the objects and drew her attention. Fresh blood revealed that the deer were killed but a short time before discovery. A few slender clues gave the deputy a working start and the case is still being investigated.

BUREAU OF GAME FARMS

Much work has been done at the Yountville and Los Serranos game farms in order to increase efficiency, capacity and production. One hundred new pens were constructed at Los Serranos farm thus bringing the capacity of this place up to 221 pens. At Yountville farm improve-

ments have been made in the water system for the rearing pens and the breeding pens have undergone changes that will increase efficiency.

A check of the eggs sent out in 1930 shows that in all, 871 birds were reared. In many cases bird fanciers were very successful in this work and they were encouraged to try for larger broods this coming season. It is the plan, at present, to have a distribution of about 10,000 eggs from both farms.

Game farm helpers were sent into some localities to trap quail for transfer to other places where breeding stock was badly needed. In most cases the farmers, who have been feeding and protecting the birds, offered full cooperation in the work.

It is quite noticeable that interest in game farming is increasing rapidly. We have learned this through an increase in the number of

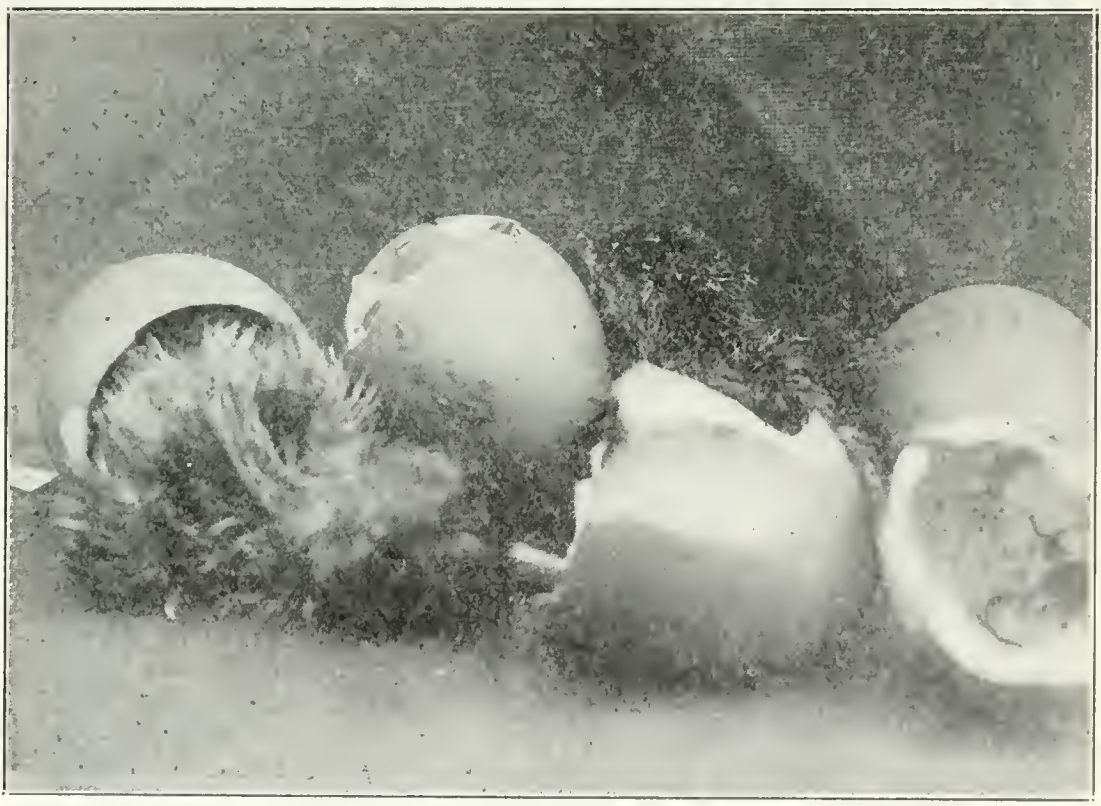


FIG. 66. Not very promising looking at this stage of the game. Ring-necked pheasants hatching from shells at the Yountville Game Farm. Photograph submitted by August Bade, 1930.

permits issued and licenses sold, as well as the letters received. The number of visitors who come to the farm are also on the increase.

Evidences of an early season are quite noticeable by the laying of the turkeys and guinea fowls in January. This is a happy incident, however, as it will eliminate much congestion when the rush of the quail and pheasant broods arrives. It is hoped to produce in excess of 30,000 pheasant eggs this season in order to care for the increasing demand from individuals and clubs.

Eggs were received late in February from guinea fowl, Chukor partridges and turkeys. A special egg room has been constructed at the Yountville farm that will enable the keeping of eggs at the proper temperature until they are set.

Substantial plants have been made of Hungarian partridges at Redding, Red Bluff, Chico, Orland, Corning, Mariposa and several other localities. Other bird plantings occurred after due preparation.

BUREAU OF HYDRAULICS

It is interesting to note that a national magazine has taken cognizance of the fact that stream, harbor and coast pollution problems in Cali-

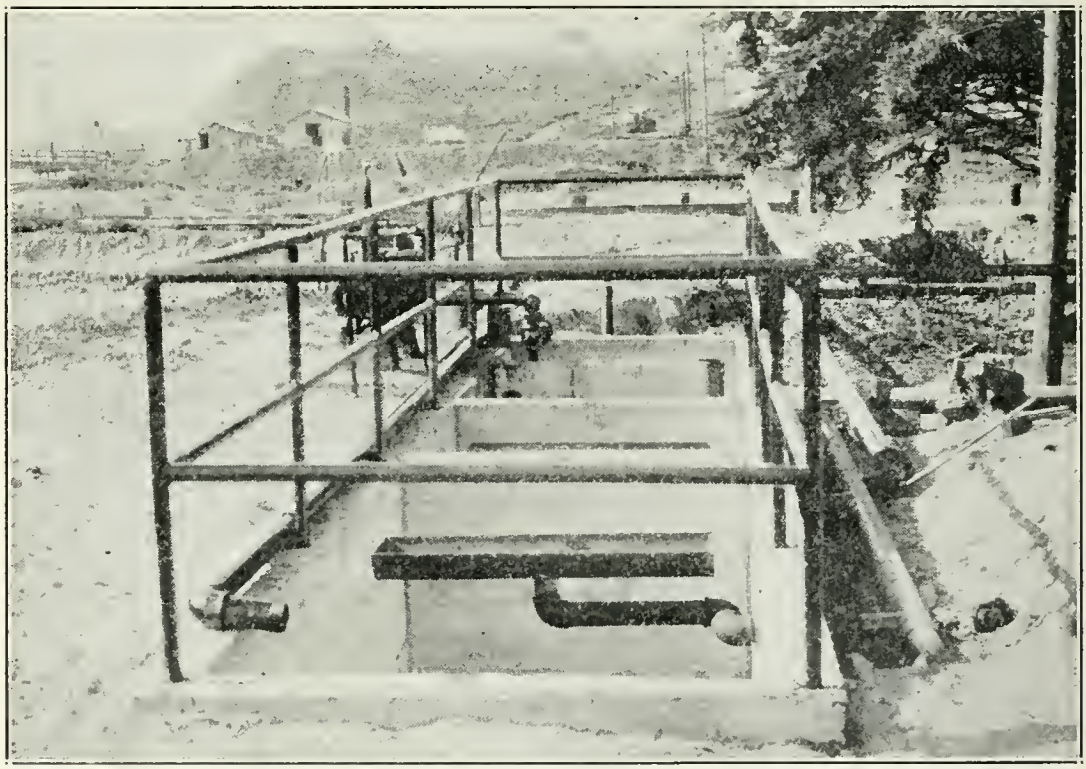


FIG. 67. Concrete sump used for removing all oil from waste water before water is dicharged into ocean. Photograph submitted by John Spencer, February, 1931.

fornia are being handled in a commendable way. A paragraph taken from a story entitled "The Menace of Oil Pollution," appearing in the October issue of *The Auk*, reads as follows: "What is the answer? Many states have passed stringent anti-pollution laws which, if vigorously enforced, would do much to relieve the deplorable conditions existing in vast areas of coast, river, and marsh. Some states, notably California, have shown a most commendable activity in enforcing these laws, but in others they exist merely on the statute books."

Close watch is constantly kept on all vessels and other agencies to see that bilge oil and other contaminating refuse is not allowed to escape on the waters within our State boundaries. A shipping company recently spent more than $1,000 to clean up a spill in San Francisco Bay; as the shipping companies have learned to respect the determination of the State on these matters, trouble is rarely experienced in the righting of a wrong.

In line with this work, it is interesting to note that recently two ship service companies in San Pedro harbor have equipped two boats for the purpose of cleaning up oil spills and present reports indicate that

they work satisfactorily. The boats contain salvage tanks, according to description, and suck the oil from the surface of the water by means of hose and pumps.

Officers of this bureau ascribe to no special program in the patrolling of the State. Such a plan eliminates the "chance shot" methods that ordinarily would be employed by unscrupulous agencies.

California being a large oil producing State, naturally the risk from oil well waste is great. Regular patrols are made of the various fields and fair warning is given where conditions are found to be unsatisfactory. If warnings are not heeded stronger action, in the nature of legal procedure, is taken. However, in the great majority of cases full cooperation is offered by the oil men.

Other agencies that cause the destruction of our fish life also come under the jurisdiction of this bureau. Irrigation, water power developments and other activities involving our streams and rivers create

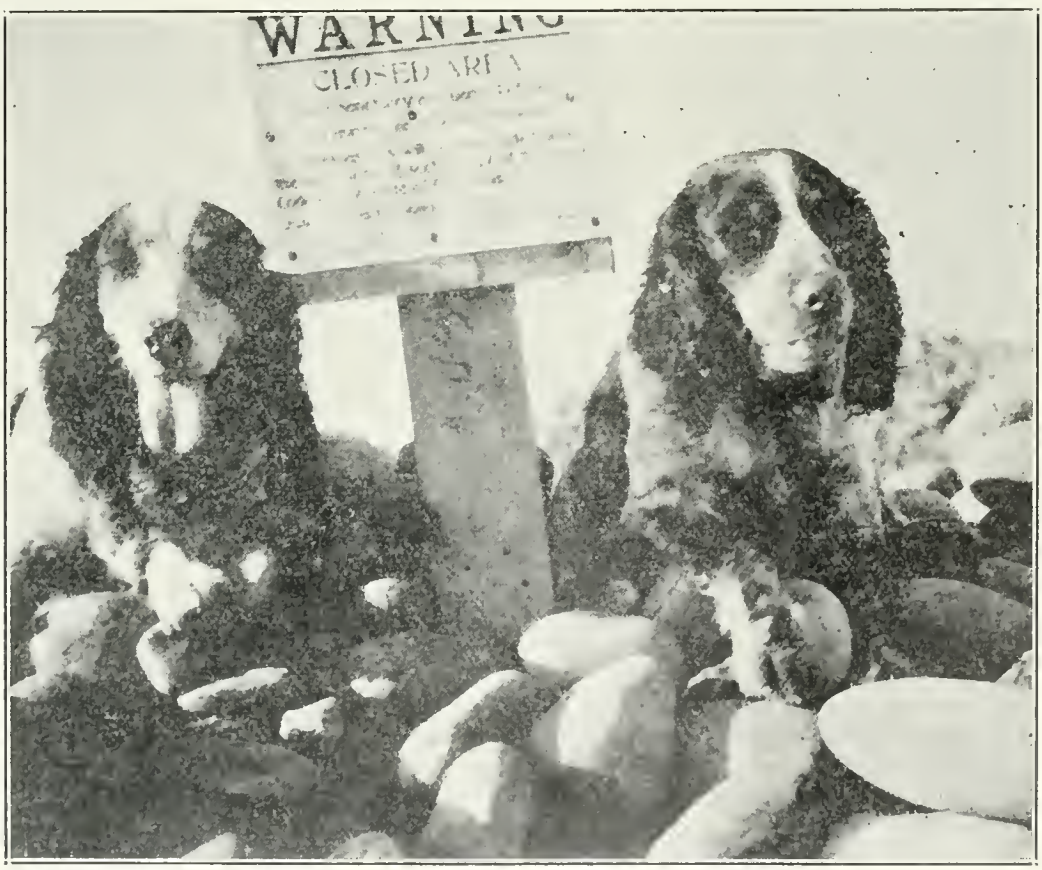


FIG. 68. If you don't believe in quail sanctuary signs just start an argument with these two guards. These springer spaniels, Duke and Tut, belong to R. P. Meigs, volunteer deputy from Sacramento. The warning sign is placed on Natomas island near Fair Oaks. There were no trees on this outer boundary so it was necessary to construct wood frames for sign holders. Photograph by R. P. Meigs, February, 1931.

certain serious problems. It is the desire of the bureau to offer full protection to our wild resources with as little hardship on developing organizations as possible. It is absolutely necessary to place screens, fish ladders, etc., in many instances to prevent startling losses and much work is being done on these problems.

VOLUNTEER DEPUTIES

While this department is not a separate bureau and ordinarily would come under the Bureau of Patrol, the nature of the work is so important that it deserves singular mention in these columns.

To begin with, the volunteer deputies, under the leadership of Captain Walter R. Welch, have been instrumental in establishing the great system of inviolate quail sanctuaries now in the process of development. This excellent work is believed to be one of the outstanding features in upland game bird conservation during the past year.

It was a well established fact that California quail were far on the road to extermination. Game laws, game farms and other heroic measures did not seem to be able to bring the birds back as fast as they were disappearing. Then, through the efforts of Captain Welch, the sanctuary system was selected for application; Welch based his belief on the fact that private land owners had achieved success in propagating quail by this method.

Success seemed to be eminent from the very start. The advance is really remarkable. To date there are more than 700 sanctuaries scattered throughout the State and it is estimated that these protected lands harbor approximately 225,000 valley and mountain quail; the land set aside totals about 500,000 acres.

In selecting these sanctuaries the deputies are instructed to make careful survey of the land before a preliminary report is made. Relative food supplies, watering facilities, climatic conditions, protective vegetation and other points are given full consideration. Care is also taken to prevent the overlapping of sanctuaries in order that the hunter, in season, is not faced with a shortage of huntable ground.

When once the sanctuary is formed, the deputies make regular and frequent patrols, exercise reasonable control over known predators and see that conditions are made suitable for the welfare of the birds. It is estimated that a period of not less than three years will be neeessary before the quail will be able to multiply into a population of safe numbers.

Other patrolling duties are performed by the volunteers as required.

LIFE HISTORY NOTES

THE TYPE LOCALITY OF THE CALIFORNIA QUAIL

In the *Condor,* Vol. XXXIII, January, 1931, pages 37 and 38, Dr. J. Grinnell of the University of California, Museum of Vertebrate Zoology, under date of November 29, 1930, has asserted that through research he has discovered that the scientific names applicable in recent publications to the California and California valley quail are incorrect.

The California quail was first named scientifically by George Shaw and Francis P. Nodder in the "Naturalist's Miscellany," Vol. 9; 1797 (1798). There is a plate, No. 345, and an accompanying text. The name given was *Tetrao californicus.* Shaw and Nodder state that, "This curious bird is a native of California and was brought over (to England) by Mr. Archibald Menzies, who accompanied Captain Vancouver in his late expedition. The specimen from which the present figure was taken is in the British Museum." This specimen is no longer extant.

The original description is so inaccurate that its application to subspecies was impossible since there was little or no direct description to place it on the brown backed coast race or the grayish backed race of the interior, unless the statements, "Its general tinge is bluish-cinereous or dove colored. . . . ; the wings are of an earthy or dull brown . . . ," would slightly tend to eliminate the former or interior form.

In reading Vancouver's "Voyage of Discovery" (1798, 3 vols.) Dr. Grinnell concluded that the type in question was obtained at either San Francisco or Monterey, but with nothing to determine as to which place it was. He goes on to say, however, "but fortunately Menzies' journal, recently published (Eastwood, California Historic Society, quarterly, Vol. 2, 1924, pp. 265–340) provides the deciding evidence. Under date December 5, 1792, Menzies' records (*loc. cit.,* p. 286) strolling out from the Presidio (of Monterey) 'towards Punta de Pinos' and seeing, besides many plants of interest to him a 'great variety of the feathered tribe, many of which were also new, among these' being a 'species of quail of a dark lead color'," etc. Farther down on the same page Menzies says: "The two following days I remained on board (the ship *Discovery*) examining, drawing and describing my little collection and such other objects of natural history as were brought me by the different parties (from the ship) who traversed the country. . ."

Thus it is definitely settled that the type locality of the California quail is set at Monterey, California. But, Dr. Grinnell finds upon examination of specimens that the quail of Monterey are not of the coast humid belt race, as has always been generally supposed until now. He says: "They are definitely of the interior race. The name *vallicola* of Ridgway thus falls as a synonym of *Californica,* using the later name now in the subspecific sense. Indeed, I am unable to see any material differences between fresh plumaged Monterey birds and similarly plumaged birds from the upper Sacramento Valley. Shaw and Nodder's name must thus henceforth apply to what we have been calling *vallicola.*"

Therefore, we find a considerable change in the scientific names of California quails and he now finds that an available name for the brown backed race of the humid coastal strip is *Lophortyx californicus brunnescens* of Ridgway (Proc. Biol. Soc. Wash., Vol. 2, 1884, p. 94). The type specimen has been recently examined by Dr. Grinnell, through the courtesy of Dr. Alexander Wetmore of the United States National Museum. This was supposed to have been taken by J. K. Townsend at Santa Barbara, Baird apparently having inscribed the label according to Audubon (Birds, American, Vol. 5, 1842, p. 67). But this could not have been because of the subspecie characters of the specimen. Dr. Grinnell goes on to say: "Nor could it have come from the Columbia River as suggested by Ridgway (*loc. cit.*); nor, indeed, could it have been collected by J. K. Townsend at all as I shall set forth in another connection.

"Briefly, the type of Ridgway's *brunnescens* falls in accurately with skins from the San Francisco Bay region, and for various reasons its locality can now safely be fixed as San Francisco. By this decision the quail of this group as represented in California may now be listed as follows:

1. *Lophortyx californica californica* (Shaw and Nodder) Valley California quail.

2. *Lophortyx californica brunnescens* (Ridgway) Coastal California quail.

3. *Lophortyx californica catalinensis* (Grinnell) Santa Catalina Island California quail."

Thus we see a two-thirds revision of California quail group, *catalinensis* only, remaining unchanged.—D. D. McLean, 510 Russ Building, San Francisco, California.

ELK IN SUISUN MARSHES IN LATE FIFTIES

Very soon after the discovery of gold filled the Sierra Nevada with miners, the numbers of California Valley elk *(Cervus nannodes)* began to decrease. Constant harassment soon found them absent in the foothills, while the settlements in the San Joaquin Valley and the encroachment of civilization caused the bands that had survived to seek a refuge from persecution in the tule marshes and the wilderness of the river bottoms. In the late fifties glimpses of the animals in the Suisun marshes was considered one of the real rewards of the river journey.

The Weekly Ledger, published at Jackson, California, in its issue of April 18, 1857 (Vol. 2, No. 26), says:

"We presume that comparatively few persons who travel up and down the great streams that empty into Suisun Bay are aware of the immense numbers of wild animals that frequent the inaccessible tules in this vicinity. The passengers of the *Antelope,* however, in her last downward trip, were favored with a sight of a herd of noble elk,

browsing in the margin of the bay; but it was a passing glimpse only, for as the boat approached the shore, the beautiful animals threw aloft their gigantic antlers and plunged into the depths of the marsh.'' —Rodney S. Ellsworth, 510 Russ Building, San Francisco, January 8, 1931.

FLAT FISH EAT CRABS

The trawlers working off shore near Eureka, California, have recently reported finding small crabs in the stomach of flat fish which they obtained in from 80 to 100 fathoms of water. These crabs were



FIG. 69. Tule elk bull caught during a quiet interval by camera. Photograph by E. S. Cheney, 1930.

thought to be the young of the edible crab *(Cancer magister)*. On December 31, 1930, a number of stomachs of the round nosed sole *(Eopsetta jordani)* were examined at the Western California Fish Company in San Francisco. These fish were taken at about 80 fathoms, off Eureka, on December 29, 1930. Six stomachs were examined, containing 21 crabs *(Cancer gracilis)*, ranging in size from 24 mm. to 42 mm. There were 12 males, 8 females and 3 which could

not be identified as to sex. One female, 28 mm. in width, had a mass of orange colored eggs attached. With the exception of three specimens, which were partly digested, the crabs were in very good shape and looked as though they had just been swallowed whole. None of the legs were missing or damaged and the carapaces were entire. *Cancer gracilis* is a small form of crab which seldom grows to more than 3 inches in width and has no value commercially. The fact that the crabs were taken from the stomachs of fish taken, according to report, in 80 fathoms of water is of interest, as they are supposed to be a shallow water form.—Paul Bonnot, 510 Russ Building, San Francisco, January 15, 1931.

CARP CHOKES BASS

While patrolling last Saturday morning (November 29, 1930) I dropped in at Frank Doty's boat camp on the Mokelumne river. Looking down the stream I noticed a fish floating on the surface, belly up, coming in with the current.

We both wondered how it had been killed, so Frank jumped into one of his boats, rowed out into the stream and picked it up. In place of one, we found two fish and our surprise was complete.



Fig. 70. This is what happens when the "worm" turns. This big striped bass strangled on a carp, his intended meal. The tragedy occurred in Mokelumne river and was photographed in November, 1930, by Alvin Granstrom.

The large fish was a bass weighing 29 pounds and measuring 42 inches from nose to tail. Sticking out of its mouth was a 3-pound carp that measured 19 inches in length.

Apparently the bass was dead when we picked it up but the carp was very much alive and kicking. It was the first time either of us had ever heard of fish being found alive under the circumstances, although records show that specimens have been found dead along shore from like causes.

Here is what happened. When the bass attempted to swallow the carp, the smaller fish wiggled his head out through the larger one's gills, held this breathing member open and thus cut off the proper supply of oxygen from the enemy. The gills of the smaller fish became entangled with the gill of the larger fish and thus prevented a disgorging process—the carp was too large to slide on through the gill.

Ultimately the carp would have become a victim of his own trick, although he had the satisfaction of causing the death of his cannibalistic attacker.—Alvin Granstrom, Ryde, California, December 6, 1930.

SEA LION AND SEA DUCKS

Sea ducks apparently have little fear of sea lions.

Not long ago I was standing on a pier at Del Rey, Santa Monica Bay, with E. A. Chan, deputy from Long Beach, when our attention was called to a small flight of sea ducks loafing along shore just outside of the big breakers. The birds would drift so close to the crest of the great waves that it seemed likely they would soon be carried over and dashed against the sandy beach. It was a fascinating sight to watch them play their perilous game.

Suddenly a California sea lion showed its head above the surface at a considerable distance from the birds—and as suddenly disappeared. Presently the shiny head appeared again, but this time in the near vicinity of the ducks. Again the mammal dived.

Chan and I speculated on the location of the animal's next appearance and predicted that the ducks would soon take to flight. We noted that the birds had suddenly "come to life," but instead of portraying any sign of nervousness, proceeded to dive and play about among the steady swells.

We were both wrong. The ducks did not fly and the sea lion came up much closer to the water fowl than had been anticipated. In fact, from where we stood on the pier it seemed as though the animal was within 8 or 10 feet of the birds.

After pointing his nose toward the heavens for a few seconds the lion made a graceful dive directly beneath the ducks and came up a few minutes later a short distance away. Both species appeared to be having a grand time.

Chan and I watched the proceeding for a short while. Finally the lion pursued a course along the shoreline in the direction of Santa Monica, while the birds continued to drift along in perfect contentment.—Earl Soto, 510 Russ Building, San Francisco, January, 1931.

REPORTS

FISH CASES

October, November, December, 1930

Offense	Number of arrests	Fines imposed	Jail sentences (days)
Angling License Act; violations of	30	$268 00	177
Abalones; overlimit; undersized	30	700 00	
Barracuda; small	1	50 00	
Bass, striped; small; overlimit	24	548 00	61
Bass, black; spearing of	3	75 00	
Clams; small; overlimit	112	3,130 00	26
Commercial Fishing License Act; violations of	49	480 00	
Crabs; closed season	10	205 00	30
Explosives; killing fish with	3	400 00	
Fishing near dam or fishway	7	40 00	
Lobsters; small; closed season	31	1,340 00	20
Night fishing	11	65 00	
Pollution of stream	1		
Salmon; untagged; spearing of	46	1,032 00	78
Seines; nets; illegal use of	15	725 00	
Trout; closed season	6	450 00	
Illegal fishing apparatus	20	350 00	100
Miscellaneous	2	5 00	
Totals	401	$9,863 00	492

GAME CASES

October, November, December, 1930

Offense	Number of arrests	Fines imposed	Jail sentences (days)
Hunting License Act; violations of	65	$1,430 00	30
Bear; closed season	2	35 00	
Commercial Gun Club License Act; violation of	4	80 00	
Ducks; overlimit	5	255 00	25
Doves; overlimit; closed season	6	150 00	
Deer; untagged; killing of does, spiked bucks, fawns	83	3,875 00	552
Hides; deer	1		
Hunting in refuge	11	450 00	
Night hunting	47	1,000 00	30
Nongame birds; killing of	24	760 00	
Pigeons; closed season	1	50 00	
Pheasants; killing of	3	75 00	
Quail; closed season; overlimit	21	1,090 00	120
Rabbits; closed season	1		5
Shorebirds; killing of	27	612 50	
Swan; illegal possession of	6	125 00	5
Trapping song birds	3	75 00	
Tree squirrels; killing of	3		5
Trespassing	3	35 00	
Turkeys, wild; killing of	1		
Trapping License Act; violation of	3	40 00	
Wood ducks; killing of	6	150 00	
Shooting from auto or motor boat	14	350 00	
Totals	340	$10,637 50	772

SEIZURES OF FISH AND GAME

October, November, December, 1930

FISH—		GAME—	
Abalones	493	Deer	39
Abaloues, pounds	1,200	Deer meat, pounds	533
Barracuda, pounds	1,964	Ducks	246
Bass, Striped	120	Doves	50
Bass, black	3	Elk meat, pounds	55
Clams	2,031	Geese	3
Catfish, pounds	42	Nongame birds	52
Crabs	101	Pheasants	10
Lobsters	1,046	Pigeons	7
Lobsters, pounds	1,838	Quail	515
Salmon, pounds	2,444	Rabbits	1
Sardines, pounds	15	Shorebirds	92
Steelhead (trout)	4,898	Squirrels	7
Trout (brook)	20	Swans	8
Spears, fish; traps	57	Wood ducks	20
Whiting	4	Shotguns	2
		Hides	3

STATEMENT OF EXPENDITURES

For the Period July 1, 1930 to December 31, 1930, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Bureau Administration:					
Executive	$3,000 00			$6 46	$3,006 46
Clerical and office	10,554 52	$452 85	$240 30	352 43	11,600 10
Printing		2,506 05			2,506 05
Automobiles		169 95	57 08	1,503 90	1,730 93
Traveling			1,413 67		1,413 67
Postage			2,482 65		2,482 65
Telephone and telegraph			1,804 72		1,804 72
Freight, cartage and express			1,201 32		1,201 32
Rent			7,422 84		7,422 84
Heat, light and power			27 44		27 44
Accident and death claims			4,735 66		4,735 66
Accounting pro rata	2,250 00				2,250 00
Legal	3,300 00		64 10	19 85	3,385 95
Publicity			13 00		13 00
Total bureau administration	$19,104 52	$3,128 85	$19,462 78	$1,882 64	$43,578 79
Bureau Education and Research:					
Chief and assistant	$5,250 00			$12 92	$5,262 92
Clerical and office	960 00	$180 59	$71 15	150 63	1,362 37
Traveling			3,532 69		3,532 69
Freight, cartage and express			8 52		8 52
Photographer	600 00		48 00	475 50	1,123 50
Librarian	892 90	8 05	36 17	121 19	1,058 31
Research	3,350 00	269 74	2 00		3,821 74
Publicity			284 30		284 30
Temporary help	448 00				448 00
Summer educational work	546 68				546 68
Telephone and telegraph			9 37		9 37
Total bureau education and research	$12,247 58	$458 38	$3,992 20	$760 24	$17,458 40
Bureau Patrol and Law Enforcement:					
Chief and assistants	$5,370 00			$6 46	$5,376 46
Clerical and office	1,557 50	$154 57	$9 94	48 03	1,770 04
Automobiles		4,782 90	1,744 00	8,528 25	15,055 24
Traveling			65,527 57		65,527 57
Postage			320 43		320 43
Telephone and telegraph			802 98		802 98
Freight, cartage and express			39 46		39 46
Rent			364 10		364 10
Heat, light and power			7 48		7 48
Captains and deputies	104,676 11	504 31	77 50	88 39	103,346 31
Launches	1,020 00	720 29	1,952 60	165 90	3,858 78
Fish planting	1,729 56	384 73	104 50		2,218 79
Volunteer deputies	285 00				285 00
Premiums on bonds			937 73		937 73
Temporary help	230 50				230 50
Total bureau patrol and law enforcement	$114,868 67	$6,546 79	$17,888 38	$8,837 03	$202,140 87
Bureau Commercial Fisheries:					
Chief and assistants	$5,820 00				$5,820 00
Clerical and office	4,566 67	$37 33	$63 15		4,667 15
Automobiles		299 39	134 80		434 19
Traveling			9,059 82		9,059 82
Postage			2 94		2 94
Telephone and telegraph			180 02		180 02
Freight, cartage and express			80 86		80 86
Rent			457 50		457 50
Heat, light and power			111 89		111 89
Research	4,800 00	31 47	15 75	$43 63	4,890 85
Inspectors	10,962 86				10,962 86
Captains and deputies	7,622 50	63 07	11 77		7,697 34
Launches	6,234 69	2,988 86	1,774 11	2,259 19	13,256 85
Laboratory	16,172 50	402 92	1,288 28	930 54	18,794 24
Fish tags		202 00			202 00
Salmon tagging			3 50		3 50
Botulism			7,500 00		7,500 00
Statistics	1,470 00	299 00			1,769 00
Blue printing			15 29		15 29
Total bureau commercial fisheries	$57,649 22	$4,324 04	$20,699 68	$3,233 36	$85,906 30

STATEMENT OF EXPENDITURES—Continued

For the Period July 1, 1930 to December 31, 1930 of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Bureau Fish Culture:					
Chief and assistants	$3,300 00		$4 00		$3,304 00
Clerical and office	2,022 58	$47 47	9 68		2,079 73
Automobiles		2,774 05	1,510 09	$4,912 68	9,196 82
Traveling			7,131 04		7,131 04
Postage			64 00		64 00
Telephone and telegraph			554 98		554 98
Freight, cartage and express			553 16		553 16
Rent			970 61		970 61
Heat, light and power			390 10		390 10
Hatcheries	67,597 92	32,764 74	798 33	917 53	102,078 52
Hatcheries—additions and betterments				23,583 71	23,583 71
Special field investigation	6,383 00	159 53	25 00	20 00	6,587 53
Fish cars	2,479 84	297 17	578 21	5 95	3,359 17
Blue printing			4 20		4 20
Total bureau fish culture	$81,783 34	$36,042 96	$12,593 40	$29,437 87	$159,857 57
Bureau Hydraulics:					
Chief and assistants	3,090 00		2 70		3,092 70
Clerical and office		25 47	13 98		39 45
Automobiles		206 02	118 90	1,077 50	1,402 42
Traveling			635 59		635 59
Telephone and telegraph			3 14		3 14
Blue printing			12 40		12 40
Cooperative research	1,500 00				1,500 00
Total bureau hydraulics	$4,590 00	$231 49	$786 71	$1,077 50	$6,685 70
Bureau Game Propagation:					
Superintendents	$3,875 00				$3,875 00
Automobiles		$297 23	$182 29		479 52
Traveling			993 36		993 36
Postage			5 51		5 51
Telephone and telegraph			81 00		81 00
Freight, cartage and express			47 38		47 38
Heat, light and power			570 35		570 35
Maintenance		5,379 55	422 14	$3,541 57	9,343 24
Temporary help	1,971 64				1,971 64
Assistants	2,280 00				2,280 00
Purchase of game birds		3,963 93			3,963 93
Total bureau game propagation	$8,126 64	$9,640 69	$2,302 03	$3,541 57	$23,610 93
Bureau Fish Rescue:					
Chief and assistants	$2,350 00	$14 95	$139 90		$2,504 85
Traveling			1,048 08		1,048 08
Rent			109 00		109 00
Temporary help	245 00				245 00
Total bureau fish rescue	$2,595 00	$14 95	$1,296 98		$3,906 95
Bureau Game Refuge:					
Chief and assistants	$1,999 98				$1,999 98
Clerical and office	1,308 45	$1 00	$1 25		1,310 70
Automobiles		408 56	129 30	$1,136 32	1,674 18
Freight, cartage and express			50		50
Traveling			485 28		485 28
Lion hunters and trappers	4,747 00				4,747 00
Refuge posting	3,312 05	4 80			3,316 85
Predatory animal control			3,120 00		3,120 00
Refuge maintenance		509 68	129 54	697 46	1,336 68
Postage			49		49
Total bureau game refuge	$11,367 48	$924 04	$3,866 36	$1,833 78	$17,991 66
License commissions					$31,569 30
State fair and other exhibits					4,546 85
Prior year expense—81st fiscal year only					2,845 52
Prior year expense—80th fiscal year only					15 87
Grand total proprietary group					$600,082 95

STATEMENT OF INCOME

For the Period July 1, 1930 to December 31, 1930 of the Eighty-second Fiscal Year

	Detail	Total
Departmental Income:		
License Sales—		
Angling licenses, 1930	$325,179 50	
Commercial hunting club licenses, 1930-31	2,110 00	
Angling licenses, 1931	99 00	
Commercial hunting club operators licenses, 1930-31	620 00	
Deer tags, 1930	120,186 00	
Fish breeder's licenses, 1930	20 00	
Fish importers' licenses, 1930	10 00	
Game breeders' licenses, 1930	142 50	
Hunting licenses, 1929	55 00	
Hunting licenses, 1930	280,035 70	
Hunting licenses, 1931	178 00	
Market fishermen's licenses, 1930-31	26,790 00	
Trapping licenses, 1930-31	1,440 00	
Wholesale fish packers and shellfish dealers licenses, 1930-31	1,065 00	
Wholesale fish packers and shellfish dealers licenses, 1929-30	5 00	
Total licenses sales		$757,935 70
Other Income—		
Court fines	$37,623 75	
Fish packers' tax	43,865 10	
Fish tag sales	1,545 08	
Game tag sales	81 30	
Interest on bank balances	3,701 36	
Kelp tax	73 88	
Miscellaneous sales	323 20	
Total other income		87,213 67
Total departmental income		$845,149 37
Income for the State University Fund:		
Kelp tax	$36 91	

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1930

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Albacore									111,970
Anchovies							12,400		8,440
Barracuda									
Bonito									245
Carp				690	13,603	569			
Catfish		7,777		1,190	86,674	34,154			
Cultus Cod	247,038	14,014					144,040	9,405	52,547
Eels			10						
Flounders	1,329	4,940					48,866	21	30
Grayfish	2,345						46,801	3,820	
Hake							638		
Halibut	72,211	53	16				3,887	47	5,225
Hardhead					24,470				
Herring	550		250				27,171		
Kingfish							1,589	21,612	31,008
Mackerel							7,299	2,088	359,400
Mackerel—Horse								30	51,200
Mackerel, Spanish									
Mullet									
Perch	5,586		10,308				14,112		1,229
Pike				64	265	498			
Pompano									82
Rock Bass									
Rockfish	81,826	6,577					261,273	303,129	336,228
Sablefish	48,832	19,070					17,559	40,022	4,468
Salmon	54,539			1,534	313	1,182			
Sandabs	29,764	6,240					55,071	6,244	876
Sardines							27,580,952	385	100,689,290
Sculpin									
Sea Bass—Black									
Sea Bass—White	119		6,708				20,723		519
Shad				2,783	1,016	2,775	23		
Sheepshead									

Skates	3,030						43,918	608	1,858
Skipjack									
Smelt	14,638		6,699				14,014	23,903	59,999
Sole	1,501,130	16,490					690,561	70,486	6,055
Splittail					830	6,560			
Striped Bass				46,830	56,391	116,966	52		
Suckers					4				
Swordfish									
Tomcod	712						2,175		
Tuna—Bluefin									
Tuna—Yellowfin									
Turbot			241				472		
Whitebait	696						2,731		
Whitefish									
Yellowtail									
Miscellaneous	31,717	284				37	652	1,384	233
Total fish	2,096,062	75,445	24,232	53,091	183,566	162,741	28,996,979	483,184	101,720,902
Crustaceans:									
Crabs	[1]3,432		[2]11,016				[4]600,480	[6]120	
Shrimps			344,943				171,866		7,506
Spiny Lobsters									
Mollusks:									
Abalones									799,950
Clams—Cockle		30	27,371						
Clams—Mixed	6,636								
Clams—Pismo								48	4,136
Clams—Softshell			20,688			4,378	833		
Cuttlefish							234	64	4,346
Oysters—Eastern			[3]71,077				[5]154,385		
Oysters—Native			526				14,129		
Squid									196,843
Miscellaneous:									
Turtles									
Totals	2.106,130	75,475	499,853	53,091	183,566	167,119	29,938,906	483,416	102,733,683

All amounts shown in pounds unless otherwise specified. Skipjack and Albacore cleaned.

[1] 143 dozen.
[2] 459 dozen.
[3] 323,080 Shell Oysters.
[4] 25.020 dozen.
[5] 701.750 Shell Oysters.
[6] 5 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1930—Continued

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into San Pedro	Fish from south of the International Boundary brought into San Diego	Total Fish from south of the International Boundary brought into California
Albacore		94,083		91	206,144			
Anchovies		1,046			21,886			
Barracuda	100	230,716	234	74,320	305,370	606,125	153,359	759,484
Bonito		533,257	1,004	38,339	572,845	5,126	16,817	21,943
Carp		2,075			16,937			
Catfish					129,795			
Cultus Cod		20			467,064			
Eels		10			20			
Flounders	51	3,337	5		58,579			
Grayfish		33,809	16,120	18,024	120,919	1,555		1,555
Hake					638			
Halibut	81,739	60,304	1,855	3,648	228,985	512	2,885	3,397
Hardhead					24,470			
Herring				43,579	71,550			
Kingfish	40	71,183	458	709	126,599			
Mackerel	30	5,740,879	236,215	58,472	6,404,383			
Mackerel—Horse		86,880			138,110			
Mackerel, Spanish						8,726	9,282	18,008
Mullet		710	3,570	19	4,299		6,511	6,511
Perch	230	23,302	83	40	54,890			
Pike					827			
Pompano		320		21	423			
Rock Bass	3,165	22,027	19,978	14,275	59,445	1,902	6,691	8,593
Rockfish	2,991	518,276	5,852	134,813	1,650,965		3,140	3,140
Sablefish		462	290		130,703			
Salmon					57,568			
Sandabs		1,734	35		99,964			
Sardines	802,770	16,019,337		4,345	145,097,079			
Sculpin	88	18,902	3,501	6,822	29,313			
Sea Bass—Black	491	24,494	8,470	36,565	70,020	23,411	35,241	58,652
Sea Bass—White	15,006	75,395	1,514	27,192	147,176	2,671	58,594	61,265
Shad					6,597			
Sheepshead	3,527	57,297	1,030	26,131	87,985		1,755	1,755

Skates		6,230	867	45	56,556			
Skipjack		341,323	158	50,591	392,072	4,306,446	5,543,506	9,849,952
Smelt	7,959	93,830	56,910	1,831	279,783			
Sole	61,470	5,049	297	187	2,351,725			
Splittail					7,390			
Striped Bass					220,239			
Suckers					4			
Swordfish		59,187		74,998	134,185			
Tomcod					2,887			
Tuna—Bluefin		283,773		55	283,828		94	94
Tuna—Yellowfin		35		354	389	2,685,595	11,110,740	13,796,335
Turbot					713			
Whitebait					3,427			
Whitefish	641	33,402	33	34,277	68,353		4,995	4,995
Yellowtail		38,773	707	127,671	167,151	141,770	274,561	416,331
Miscellaneous		17,830	447		52,584	118,150	72,107	190,257
Total fish	980,298	24,499,287	359,633	777,414	160,412,834	7,901,989	17,300,278	25,202,267
Crustaceans:								
Crabs					[7]615,048			
Shrimps					524,315			
Spiny Lobsters	45,659	157,730	15,480	83,229	302,098		263,440	263,440
Mollusks:								
Abalones	687				800,637			
Clams—Cockle		10,568			37,969			
Clams—Mixed					6,636			
Clams—Pismo	17,965				22,149			
Clams—Softshell					25,899			
Cuttlefish		73	83		4,800			
Oysters—Eastern					[8]225,462			
Oysters—Native					14,655			
Squid					196,843			
Miscellaneous:								
Turtles							580	580
Totals	1,044,609	24,667,658	375,196	860,643	163,189,345	7,901,989	17,564,298	25,466,287

[7] 25,627 dozen.
[8] 1,024,830 Shell Oysters.

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

VOLUME 17 SACRAMENTO, JULY, 1931 No. 3

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EARLY HISTORY OF INTRODUCTION AND DISTRIBUTION OF SPINY-RAYED FISHES IN CALIFORNIA WATERS

By Charles A. Vogelsang

IN THE JANUARY, 1931, number of California Fish and Game, Volume 17, Number 1, I read with much interest the timely, instructive and splendidly illustrated article by George Neale on the spiny-rayed fishes now to be found abundantly in California waters.

In order that the date of the first successful introduction of the crappie, calico bass, blue gill and green sunfishes and the yellow perch may be historically correct, may I be permitted to offer the following data relative thereto:

Early in the month of February, 1908, during the period of my first incumbency of the position of Executive Officer of the California Fish and Game Commission, I was sent by the then Board, in response to a call from the United States Secretary of Agriculture for a representative, to attend a National Breeders Convention to be held in Washington, D. C. While there, Mr. George M. Bowers, the United States Fish Commissioner, came to me in great distress to ask if I would be willing to appear in behalf of the United States Commission before the Appropriation Committee of the House of Representatives, that their appropriations were in grave danger of being reduced one-half, that such reduction would greatly cripple, if not entirely suspend, their salmon work in the Pacific Coast states and Alaska, to the great detriment of the industry. I consented and my name was forthwith sent to the Appropriation Committee as a witness for the United States Fish Commission.

After waiting for a summons for a week, to the discomfort of Mr. Bowers, the call finally came, to which I at once responded. The Committee personnel numbered about fifteen. After a session lasting two hours, the Chairman announced that they had been in session for three weeks and this morning had received more information concerning the scope and importance of the work of the United States Fish Commission than had thus far been presented, that on behalf of his Committee, he desired to express his appreciation, that they were now about ready to go into executive session and desired me to convey his thanks to the California Fish and Game Commission. Within an hour, Mr. Bowers phoned to my hotel stating he had something important to communicate and desired that I set a time to meet him at his office in the United States Fish Commission Building.

Upon my arrival there, his first question was, "Mr. Vogelsang, what can we do for you? Our appropriations have already been voted out of Committee intact." To which I replied, "Nothing personal can be done for me, but you can do something for California." En route east, I had studied the freshwater fish supply in the fish markets of St. Louis, Chicago and Washington and assumed that some of the excellent food fishes I observed would be adaptable to certain California waters, such as lakes and power reservoirs at low altitudes, our valley rivers, lagoons and sloughs, that a supply of food fishes to those waters were needed, not only to relieve the drain on trout waters, but would afford both sport and food to thousands who were from any cause unable to travel long distances.

Mr. Bowers, who was surrounded by his staff, turned to them and said, "I now instruct you gentlemen to make a record of and carry out my promise to give to Mr. Vogelsang for the State of California, any fishes that he selects."

The aforementioned fishes were chosen with the approval of the fish culturists of the United States Bureau. Mr. Bowers then stated that it would probably be in the early autumn before delivery could be made, but that as soon as rescue work was undertaken in the Mississippi Valley waters, a carload of fishes in one of their distributing cars would be sent to California.

This promise was kept to the letter.

Under date of October 18, 1908, a letter was received from Mr. Bowers stating that a United States fish distributing car would leave the United States fish collecting station at Meredosia, Illinois, with a capacity load for California within a few days and wire notice of actual date of departure given.

This car reached Reno, Nevada, on Train No. 3, Southern Pacific Railway, on October 30, 1908, at which point it was met by our E. W. Hunt who received three cans of sunfish and one of crappie for planting in Lassen County waters.

At Truckee, California, our superintendent of fish distribution, R. W. Requa, joined the United States car with complete information as to quantities of fish to be delivered at different points en route and to assist the federal employees.

At Colfax, Nevada County, our Roy Sullaway with representatives of the Grass Valley Sportsmen's Association received a shipment of crappie and sunfish for planting in Vera Lake and similar contiguous waters.

Upon arrival at Sacramento, two good sized shipments were delivered, one to deputies George Neale and M. L. Cross, which were planted in Plumas Lake, sloughs of Feather River, near Marysville, also Washington and Brusby lakes, all tributary to the Sacramento River. The other shipment, ten cans of all varieties, was delivered to Deputy Frank McCrea, who brought them to San Francisco, where he was joined by Deputy Ernest Schaeffle and together they carried them to Clear Lake to where the distribution was made.

From Sacramento the fish distributing car proceeded to Stockton where it was met by Deputy Ray Heacock and assistants who received eight cans, six of crappie and two types of sunfish, which were liberated in the San Joaquin River and adjacent sloughs.

Continuing on to Fresno, the car was met by Deputy Andy D. Ferguson and assistants who received from it one can yellow perch, eight cans of crappie and sunfish which were given wide distribution in suitable low level waters in Fresno and Kings counties, including sloughs tributary to both Kings and the San Joaquin River.

The next stop of the United States car was at Bakersfield, where eight cans of crappie and bluegill were delivered to Deputy A. C. Tibbett and assistants who released them in the lower reaches of the Kern River or small lake near Tehachapi and Russells Lake, Ventura County.

Upon reaching Los Angeles, the remainder of the fish in the distribution car were turned over to Deputy H. I. Pritchard and assistants for liberation at eight points in Los Angeles, Riverside and Orange counties.

While it is true that a previous attempt had been made in the year 1891 to introduce these fishes, the records also show that none of them survived, due probably to the length of time consumed en route and to less efficient equipment.

The foregoing, I believe, establishes the correct dates of the first successful introduction of these valuable food and game fishes into California waters.

GROUND SQUIRREL CONTROL IN CALIFORNIA

By W. C. Jacobsen, Chief, Bureau Plant Quarantine and Pest Control, State Department of Agriculture, Sacramento, California

WHILE IT IS intended that this brief article should emphasize the importance of ground squirrel control and indicate some of the progress that has been made in methods to gain the suppression of an important pest both because of damage to agricultural crops and because of its capacity to transmit bubonic plague, we can not refrain from mentioning a few historical references.

Sir Francis Drake's voyage to the California coast was in 1579 and among the written mention of things seen, we find the following:

> "And besides a multitude of astrange kinde of Conies by farre exceeding them (the deer) in number; there heads and bodies in which they resemble other Conies; are but small; his tayle like the tayle of a Rat, exceeding long; and his feet like the pawes of Want or Moale; under his chinne, on either side he hath a bagge, into which he gathereth his meate when he hath filled his belly abroade that he may with it either feed his young or feed himselfe when he lists not to travaile from his burrough; the people eat their bodies, and make great account of their skinnes, for their kings hollidaies coat was made of them."

What the early Spanish explorers saw, we do not find recorded but the records of the early Missions indicate that there were complaints of damage to grain crops. The first intensive plan for their riddance which we have been able to find was recorded by Bancroft as follows:

"That ground squirrels had already proved a pest to the farmer at this early date is shown by the fact that about a thousand of these animals were killed in nine days of May, 1808."

During this early period of agricultural development in California, we must recall that the live stock industry was highly important and ranchers in that day probably were more concerned with their control for the purpose of saving grain crops against destruction, not recognizing squirrels in range areas as appreciable competitors for live stock forage. During later times, when the horticultural plantings became more and more common and irrigation developed, there were increasing demands for a knowledge of methods of control because of the destruction to young trees and the undermining of ditch banks. Even the "Days of '49" were not without their disturbances occasioned by ground squirrels and gophers, since a record in 1860 indicates that thirty feet of the ditch bank of the Tuolumne County Water Company were washed away, due to rodent borings, to such an extent that the water supply for one thousand miners in the vicinity of Columbia was effectually cut off.

It became well recognized that individual effort would realize only partial results against rodents of as common occurrence as ground squirrels; hence, we find there were demands for legal expedients to force the recalcitrant landowner to pay attention to controlling these rodent pests. The farm journals of the sixties contained numerous references to desirable laws and rulings, including everything from bounties to jail sentences. One suggested that a fine should be collected from an owner upon the expiration of thirty days based upon the acreage of his land, but if no action was taken to relieve the squirrel infestation, a second period of thirty days would call for a doubling of the initial fine and upon a corresponding third failure, the fine would be trebled, and so on.

The Legislature of 1869 and 1870 authorized the payment of bounties by providing the counties with authority to levy an assessment upon taxable property. This varied in amount with the counties. Some temporary relief was undoubtedly afforded but, as generally true on bounty plans, fraudulent practices entered such as one county paying for the squirrels of another and, further, when the numbers of rodents were reduced, any systematic plan of killing them for the bounty became unprofitable.

During this general period, the inventive genius of many came to the forefront with contrivances and methods for the eradication of ground squirrels. All manner of poisons were recommended and whoever proved to be the best salesman was generally the one who was able to sell his product, although frequently the results obtained from them were very meager. Carbon bisulphide as a poisonous gas came into use, however, during some of the early periods and has truly been a very successful product for ground squirrel control, its use extending to the present day.

A plan known as the ordinance-inspector system gained vogue after the heyday of the bounty schemes and more or less held sway until the finding of bubonic plague among ground squirrels, when the health

agencies sponsored legislation providing other penalties, including cost assessable against the property. But in 1917 the Legislature saw fit to include rodent control among the duties of the County Agricultural Commissioners and it so remains today.

Very effective work against ground squirrels was done during the period 1908 to 1914 by Federal, State and local health agencies in those sections where bubonic plague was determined to infect these rodents, but was gradually diminished as the objective seemed to be gained; namely, that in the coastal counties the numbers of squirrels in plague foci appeared to have become greatly reduced.

The fact that bubonic plague could be kept alive and active in a field rodent, making possible the transmissibility of it to humans whenever there was the proper association, led to very intensive search for improved methods for the suppression of squirrels. About this same time, 1908 and 1909, the United States Bureau of Biological Survey was charged with greater responsibility in the practical phases of economic zoology and in 1909 S. E. Piper of that organization developed a very sound basic formula utilizing strychnine coated whole barley with effective results. This was the first intensive attempt to utilize a basic knowledge of the ground squirrel's life history and habits, at the same time giving recognition to the fact that any poison which was effective against ground squirrels might also be detrimental to other desirable native species. This led to careful consideration of the ingredients in Piper's formula so that no appreciable harm could come to quail and to other ground-nesting birds. He determined that quail were not injuriously affected and further that by utilizing whole barley, the smaller birds were not interested in this type of bait. The health agencies encouraged the development of a pump for the more effective utilization of carbon bisulphide as a gas which, combined with the strychnine coated barley, gave two very effective methods, as a matter of fact, more successful for any systematic campaigns than heretofore developed.

This brief introduction leads us up to the past decade, which will occupy most of the balance of our narrative.

Generally speaking, the earlier measures, both legal and practical, tried against ground squirrels had been very temporary in their relief. In 1917 and 1918 it was estimated that the annual damage from ground squirrels, alone, in California was approximately $30,000,000, and this was the damage occasioned to agricultural production. A great deal of money had been spent for bounties, for temporary inspectors, for free poison, but a centralized organization was not in charge until 1917.

It is our opinion that since the State Commission of Horticulture, succeeded by the State Department of Agriculture, and the County Agricultural Commissioners have worked on a coordinated plan, the ground squirrel population in California has been reduced fully 75 per cent. It is only in occasional years that we are justified in estimating the damage occasioned by these rodents in excess of $7,500,000 annually. It varies from seven to ten millions annually.

It became necessary, following the placing of the major responsibility for ground squirrel control especially because of economic losses

to agriculture in the hands of the county agricultural commissioners, to intensify upon educational measures. Many growers were still prone to believe the man who had something to sell and the County Agricultural Commissioners found that it was not only important to indicate that there was a systematic way in which squirrels could be controlled, but also found it desirable to prepare poisoned grain at cost, reducing the expense for ground squirrel control materials by at least one-half.

In the educational work conducted, every emphasis was laid upon natural enemies as effective in destroying rodents, especially encouraging the protection of hawks, owls, weasels, badgers, snakes, recognizing, however, that the rapid development of agriculture and horticulture in the State had removed many of these valuable species by the elimination of nesting places and other satisfactory shelter.

Ever since the work has been in the hands of the County Agricultural Commissioners, every attempt has been made to introduce greater efficiency in the methods with a view to reducing the cost and improving them. During the past ten years over fourteen million pounds of prepared poisoned grains have been distributed in addition to over six million pounds of carbon bisulphide. This indicates an enormous volume of control materials and at the same time is an indication of the importance agriculture attaches to the elimination of these rodents.

What the savings to crops have been, it is very difficult to estimate for the reason that in years of high crop value, the saving has been greater than in years when the returns on the commodity were comparatively low and the volume of production great. It is safe to say, however, that the annual damage has been very materially cut down until in some counties the losses from ground squirrels are practically nihil, whereas, years ago they ran into the many thousands.

A further indication of the importance attached to rodent control is that the major farm organizations continue to make rodent control one of their important projects. The California State Chamber of Commerce has become especially interested in the problem because of the relationship to the protection of human health.

The costs of rodent control, including the expenditure by all public agencies and growers for labor and materials, will vary between $600,000 and $900,000 annually. There are years when the total cost has been very close to one million dollars. Of this amount the cost to official agencies is between $300,000 and $400,000.

We still believe that the constant search for improved methods will reveal something better than we now have. The U. S. Bureau of Biological Survey has done more to equip itself to this end than any other agency having provisions for research. Within this State the College of Agriculture of the State University has fortunately recognized the importance of sound investigational work in cooperation with other agencies in both the research and regulatory fields.

One measure that has been constantly insisted upon by the State Department of Agriculture and the County Agricultural Commissioners is that whatever methods are used that every attempt be made to have them devoid of danger to beneficial species and as specific as

possible for the species to be controlled, yet with a just leniency for the effectiveness of the methods to the purpose in view.

There has been very little difficulty with useless materials on the market for rodent control since the passing of the Economic Poison Act of 1921, which is administered by the State Department of Agriculture. Many of the undesirable preparations on the market when this act became effective automatically disappeared.

It is our belief that the economic importance of rodent control, considering the very evident damage in losses occasioned, speaks for itself. The detail of this is to be considered as established.

Another factor, however, has again entered the field in the last few years, namely: a seeming abundance of bubonic plague infection among ground squirrels in the coastal counties. It happened that in many of the areas in these counties there was nonproductive land so far as intensive agriculture was concerned, much of the land remaining in range use. This meant that the expense of ground squirrel control had been avoided whenever possible. With the health agencies limited as to finances but capably and interestedly engaged in determining the presence of plague, the State Chamber of Commerce, cooperating with the Director of Agriculture, arranged for an emergency appropriation, approved by the Governor and the Department of Finance, to cooperate in plague elimination in these areas.

This seemed to be a logical procedure in view of the fact that the agricultural agencies were already in the field to control ground squirrels for economic reasons. A special program indicating economy of operation, yet with the assurance of complete success against squirrels needed to be developed, taking from the general field control programs the best types of operation.

It was contemplated that ground squirrels in known plague areas should be eradicated or at least reduced to such numbers that there would be no further opportunity for the transmission of bubonic plague infection between them. This program has been backed by a definite cooperative agreement between the State, the county, and the landowners, providing that each shall bear a fair proportion of the cost. Where practical, the labor available on the ranch is utilized in the field but only under trained supervision. In other cases, especially trained field crews operate in such a manner that the overhead cost is small, thereby further reducing the expense from the normal cost.

Generally speaking, the agricultural agencies interested in rodent control have adopted the following program:

(1) *Strychnine coated whole barley during the dry seasons.* The extent of the dry season varies, of course, with climatic conditions. Any time after the seeds of grains or weeds ripen in late April, May or early June, is the signal for use of this material. Squirrels are normally seed eaters and the period for storing grain or seeds begins shortly after such ripened seeds are available. The effectiveness of strychnine coated grain is well known to depend upon the fact that the strychnine is released by the juices in the squirrel's mouth cavity, including the pouch, permitting the absorption of strychnine through the lining of the cheek pouch, thus rendering strychnine much more effective than would be the case if absorbed through the normal digestive process. Strychnine coated grain gives from 80 to 95 per cent

effectiveness with the first application with an average probably not to exceed 85 per cent. Continuing applications of strychnined grain on the same area materially reduce its effectiveness since the squirrels seem to become "poison-wise" in the case of this bait. However, this method is the least costly of the measures now advocated and reduces a heavy population to an extent where the more expensive methods, such as gas or thallium, can be used at a reasonable charge.

(2) *Gas methods.* After the first rains in the fall on through to the end of the rainy period and frequently for some time thereafter, poisonous gases are used whenever the squirrel population has been appreciably reduced. Carbon bisulphide still remains the most extensively used of the gas methods, although cyanide, sulphur dioxide, and chlorine gases have been used from time to time with varying degrees of success. Carbon bisulphide, generally speaking, has been more convenient for the operator and is applied either in liquid form, through the medium of a jute waste ball, or through a vaporizing pump.

(3) If areas remain that can not stand the cost burden of the gas method, we find thallium sulphate coated grain during the green feed period to be a most effective material. This poison is used on hulled barley in order that there be no hull to remove by the squirrel. When green feed is abundant, squirrels are not inclined to pouch but are inclined to consume seeds where found. If the grain could be hulled, the poisonous substance in a coating would also be discarded with the hull. Thallium sulphate is taken up during the normal digestive process. It is nonbitter in taste and is slow acting. If a good dose is ingested on the first feeding, the squirrel may be killed in a comparatively short time. However, if only a bare lethal dose is taken, it may take several days for death to ensue.

There is due recognition given to the fact that thallium sulphate is a very dangerous poisonous material and for that reason the agricultural agencies have insisted that its use be permitted only under official supervision. It has not been permitted to gain general distribution such as is the case with the normal rodent poisons. The fact that it is more dangerous to native game species than strychnine has demanded special rules and regulations for its use. The official agricultural agencies have attempted to exercise every reasonable precaution and will continue to exercise such precautions even more vigorously in the future, if it appears necessary, in order to avoid any harm to native or introduced game species.

Should a grower undertake to obtain any poisonous materials for apparent rodent control use and then utilize it against a game species for the purpose of protecting his crop, it should not be immediately construed that the game has been killed in the normal rodent poisoning program of an official agency. Further, thallium sulphate is not to be considered a substitute in any sense for the other materials. It is merely supplementary and its use is undertaken only for a comparatively short period each year when it has a recognized value. There are those who would extend its use to as much as eight months of the year, whereas, the recommendation of the Department, and the U. S. Bureau of Biological Survey cooperating, indicates that at the most only four or five months are to be considered proper for its effective use against ground squirrels in the spring of the year.

Conflicting viewpoints are bound to develop in connection with the use of any poisonous material for the control of any pest whatsoever, but just so long as we are all agreed that ground squirrels are very injurious and that agriculture is entitled to protection against rodent pests and if it is a recognized menace to game species when poison is used negligently, we can perhaps better adjust such difficulties by frank and open considerations of these important problems by the agencies or industries involved. There is little need for open controversy since it has been well demonstrated that the problems are not solved by this means but rather by sincere deliberations leading to just and equitable conclusions.

April 2, 1931.

OYSTER CULTURE IN CALIFORNIA

By H. C. McMillin and Paul Bonnot

OYSTER CULTURE, which has been neglected in California for a long time, is being revived by several old-time oyster men. The introduction and propagation of exotic species of oysters in California waters was advocated a good many years ago. Doctor Townsend, in his report on Pacific coast shellfish in the report of the U. S. Commissioner of Fisheries for 1889–91, says:

> "With evidence at hand of the propagation of our own oyster (*O. virginica*) in California, the introduction of foreign species seems superfluous; But Professor George Davidson and Mr. H. D. Dunn, of San Francisco, both of whom have resided in Japan, have frequently spoken to me of the large oyster of Japan in connection with the subject of oyster growing in California. Professor Davidson sends the following note on this subject. 'The oyster I knew in Japan was found in the vicinity of Nagasaki. * * * The oyster is there very large, full, and well flavored. I obtained some shells that were fully twelve inches long.' * * * The introduction of oysters from Japan would probably not be difficult as a great many species of shell fish from that region are identical with California species."

The eastern oyster (*O. virginica*) which Doctor Townsend mentions, was the basis of extensive activity in San Franeiseo and Tomales bays for a long time. At first seed oysters were brought out, planted on the mud flats and allowed to grow to marketable size. The eastern oyster was never successfully spawned in California, as the methods of culture were rather haphazard. Some years ago the growing of oysters from imported seed received a check. It was found that, instead of maturing into fat, healthy specimens, the oysters grew slowly and were thin and watery, and unfit for use. The reasons for this are still imperfectly known. The praetice today is to ship full-grown oysters and merely hold them on the beds until such time as they can be marketed. The oyster supply of late years has consisted of these eastern oysters in the shell, shucked easterns on ice, native oysters (*O. lurida*) called "Olympias" shipped to California from the State of Washington, and a few local natives.

There are several reasons why it would be profitable for California to grow her own oysters. It is expensive to ship mature eastern and Japanese oysters for immediate consumption. Due to lack of space, the supply of Olympias is limited. California oyster growers have therefore started oyster culture in the state on a scientific basis. To date the work has been mostly of an experimental nature, but the results so far have more than justified the efforts expended.

In 1914 Japanese seed oysters were first shipped to British Columbia. The shipment consisted of twenty boxes. In 1916, on the strength of the success in British Columbia, commercial planting of oysters was started in the State of Washington at Samish Bay. During the World War there were no importations of seed. In 1919 the business was resumed. It has spread along the coast of Washington and Oregon and is now being started in California. The results so far indicate that a valuable industry is being established. One thou-



FIG. 71. Unloading boxes of Japanese seed oysters at Elkhorn Slough. Left to right in picture are A. Vierra, H. C. McMillin and S. Togasaki. Photograph by Paul Bonnot, March 6, 1931.

sand boxes of seed oysters per year were planted in the State of Washington between 1920 and 1926. As the demand for seed increased, the Japanese seed producers began to extend their operations.

In 1925, the U. S. Bureau of Fisheries made a preliminary survey of the industry. One of the important problems which were brought to the attention of the importers and growers was the danger of imported pests. It was found that the oyster drills and other undesirable forms not only withstood the trip but were growing and reproducing in their environment, while the oyster failed to reproduce and the stock had to be continually replenished with new shipments of seed. Clean seed was an important factor and the Japanese government assisted the seed producers in the development of the "hanging" method of spat catching. This system consists of long lines of posts set into the mud, with several strands of wire running from post to post, from which other wires hang down. On these hanging wires are

threaded oyster, scallop and abalone shells, and on these the young oysters set. By this means, the surface available for oyster setting is greatly increased and, since the shells never touched the bottom, the oyster drill is practically eliminated, because it is a bottom form.

As soon as the set was finished, the shells were taken from the wires, packed in boxes, and shipped to Washington on the decks of passenger or fast freight steamers. From the idea of hanging the spat collectors has developed a float to take the place of the fences. The floats can be used in deep water and after the spawning season may be used to grow oysters for the local markets, using a portion of the seed

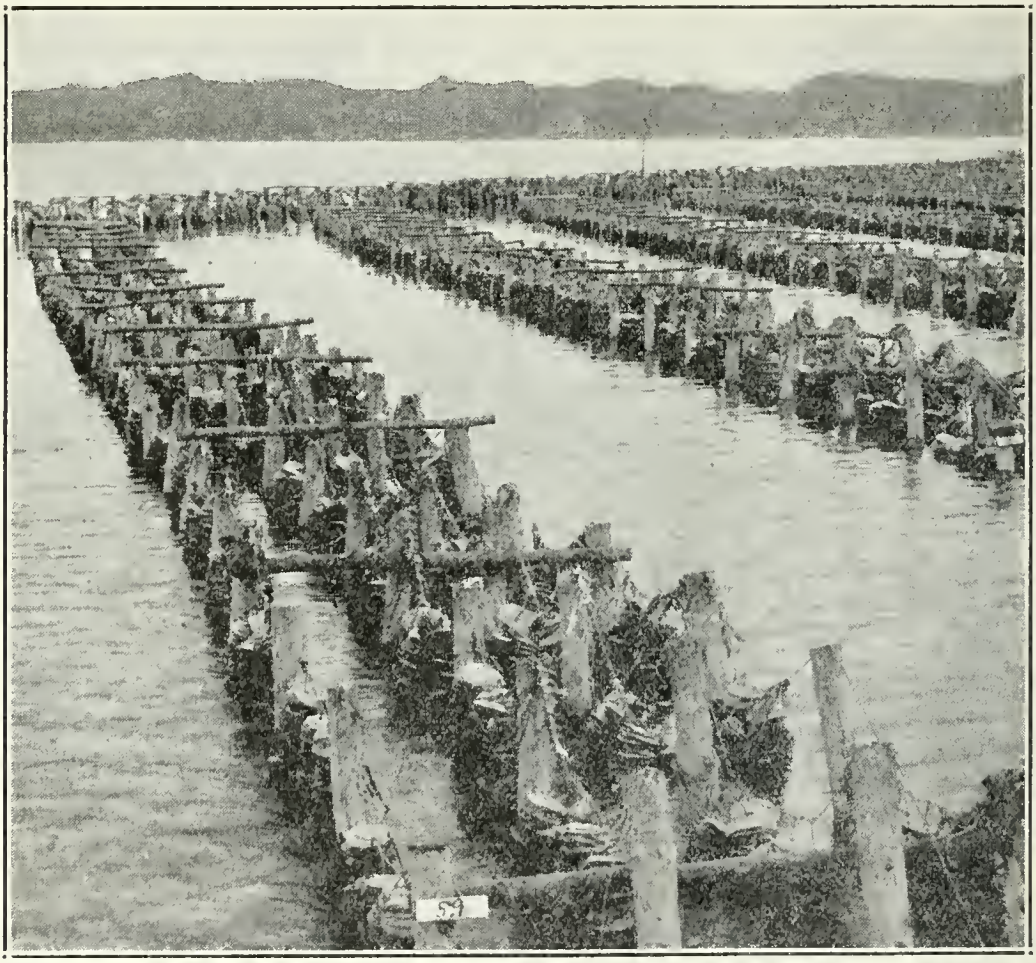


Fig. 72. A seed collecting flat at Matsushima, Japan, using the method of hanging shells on wires. Photograph submitted by H. C. McMillin, March 6, 1931.

which they have collected. After growing the oysters by this method for several seasons, it was found that when shells were strung on wires the spat set on both sides, and as the young oysters grew it was difficult to keep the shells far enough apart on the wires to allow for growth; and when the shells were bedded on mud flats a certain percentage of the young set were smothered. It was necessary, therefore, to develop a spat collector of small diameter from which the oysters could grow outward in all directions. This lead to the use of a $\frac{1}{2}$-inch tarred rope which is wound about frames, generally in lengths of 150 feet, and suspended from floats. As the spat grow outward from the center, there is plenty of room for all of them; and the



FIG 73. H. C. McMillin and S. Togasaki holding up a section of rope on which are the Japanese seed oysters. Photograph by Paul Bonnot, Elkhorn Slough, March 6, 1931.

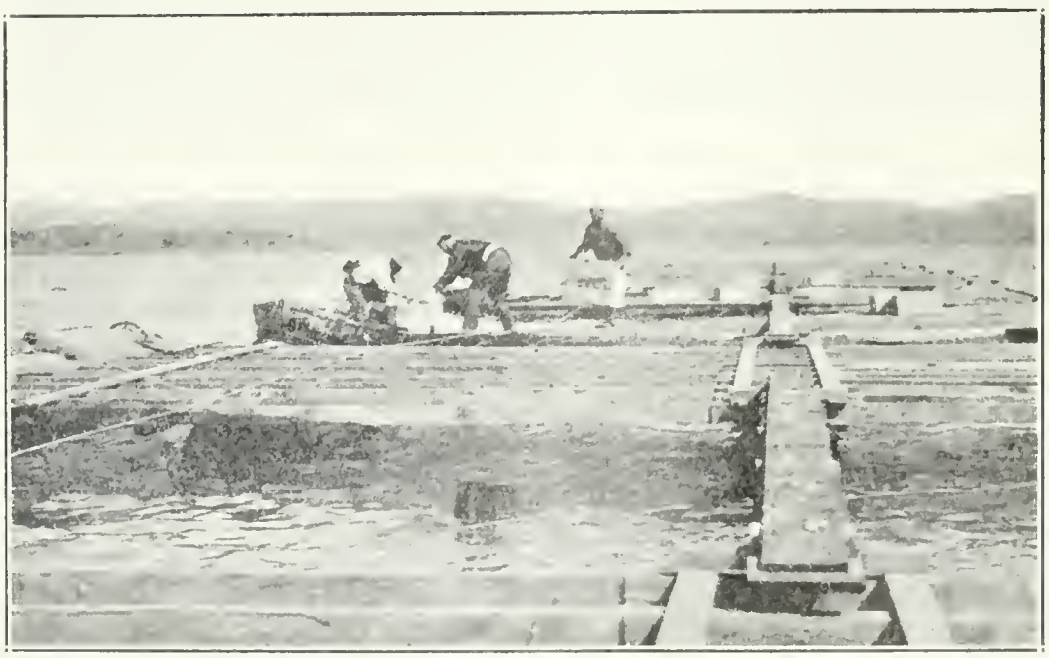


FIG 74. Unloading Japanese oyster seed on floats at Elkhorn Slough. Photograph by Paul Bonnot, March 6, 1931.

Japanese growers estimate that they can mature 100 marketable oysters to one foot of rope. After obtaining the set, the ropes are looped or cut into suitable lengths, depending on the depth of the water. If the float is anchored where there is 8 feet of water at low tide, the ropes are 8 feet long. For shipment to the United States, the ropes are slipped from the frames and packed flat in wooden boxes, four bunches or 600 feet to the box, with layers of rice straw between to reduce chafing. The floats used in Japan are made of bamboo poles, floated on barrels. Recently a shipment of 243 boxes of seed oysters on rope was put out in Elkhorn Slough, near Moss Landing, California, and similar floats were constructed to determine the feasibility of using this method.

These floats are built by placing pine 2 x 4s on edge in the manner of the floor joists of a house. They are suitably braced and

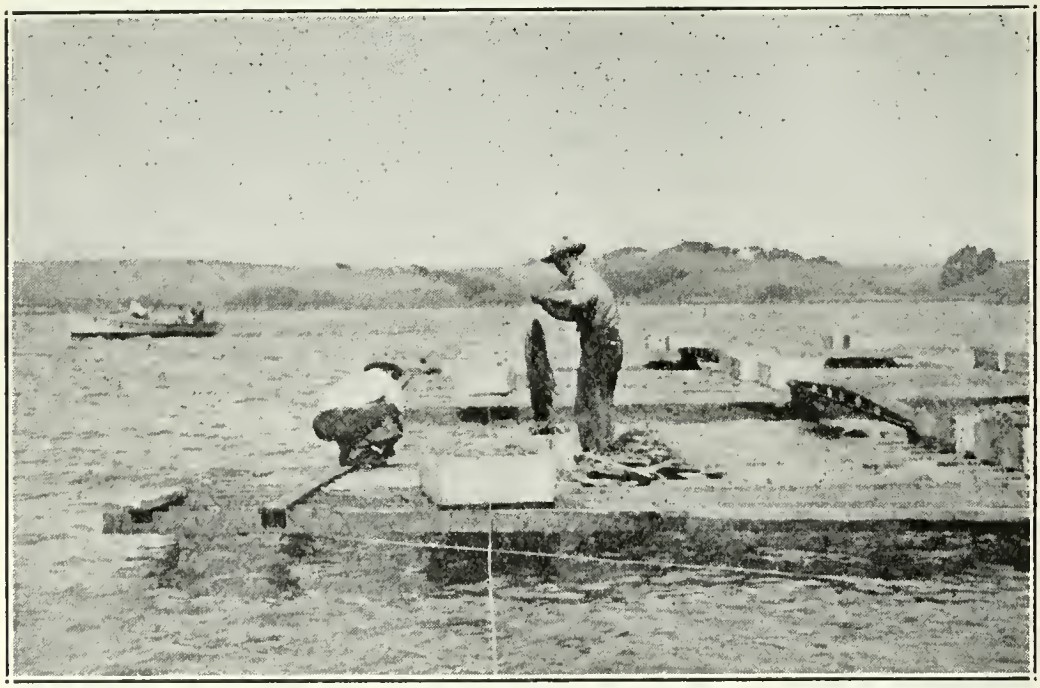


FIG. 75. Working with Japanese oyster seed on floats at Elkhorn Slough. Kosuki Miyaga, Japanese oyster expert, is in the foreground. Photograph by Paul Bonnot, March 6, 1931.

are floated by six tarred steel drums. Each float is 32 feet wide (two 2″ x 4″ x 16′, spliced together) and 18 feet long (12 joists 18″ apart). The floats are strung together in batteries to suit local conditions. They are tied together by two $\frac{1}{4}$″ steel cables which run from the anchors at each end, over the floats for the full length of the battery. A board catwalk acts as a spreader and a convenient and easy way to get from one float to another, and two cross wires between each float prevent twisting. Constant position is maintained by the use of flat cement anchors at each end of the battery and along both sides. Some 40 floats are now in operation at Elkhorn Slough under the supervision of Kuroki Miyagi, who came from Japan to put this method of oyster culture into operation in this country.

This method of oyster farming has several advantages. A maximum set of spat is possible to begin with, and after obtaining the set, the oysters can be left as they are and can develop to maturity without

crowding. The growing oysters can be easily shifted from one place to another as local conditions change. The building up of a hard bottom, which was a prime requisite under the old methods of culture, is now unnecessary. It is unnecessary to confine oyster culture to any limited zone and the three dimensions of space in the water may be utilized. The effect of pests is also reduced. The Japanese oyster drill is a bottom dwelling form and has no free swimming larval stages; therefore, it does not come in contact with the spat collectors hung from floats, and seed obtained in this manner can be imported with a minimum of danger.

AN OUTLINE OF THE HABITS OF THE BOBCAT WITH SOME DIRECTIONS FOR TRAPPING

By E. L. Sumner, Jr.

I. HABITS

THE FOLLOWING ACCOUNT of the habits of the bobcat is for the benefit of those who contemplate trapping it, and represents a brief summary of what is known about the life and ways of this animal, rather than a contribution of new material.

Bobcats are to be found in practically all of the wooded and brushy parts of the United States with the exception of a narrow strip which includes the northern portions of Montana, North Dakota, Minnesota, Michigan and the upper tier of New England States. On the Pacific Coast its range extends northward even into British Columbia, while to the south it reaches far down into Mexico. Because of its secretive habits, however, the bobcat may be fairly abundant in localities where its presence is not at all suspected, as for example in those settled areas where some few remnants of woodland or broken country still persist in the midst of the surrounding farm lands. Thickets along stream bottoms, open-forested hillsides and rocky gulches in half-open country are chosen by this cat in preference to heavily wooded forests, and this is the explanation of its survival in the face of human settlement. Although considerably reduced in numbers in the Northeastern States, it seems to be pretty well holding its own in the South and West —perhaps as well in California as in any other section of the entire country.

Dens are made in hollow trees, small caves, or openings among rock piles and the young, of which there may be two to four in number, are born about May. Not much is known about the size of the home territory covered by each individual cat except that in some localities at least, it must be of considerable extent. D. W. Maxey records finding the remains of two small plymouth rock chickens in the stomach of a bobcat which he killed at a point five miles from the place where it had caught them. It is known, however, that this animal is for the most part solitary, and that it avoids the company of others except during the breeding season.

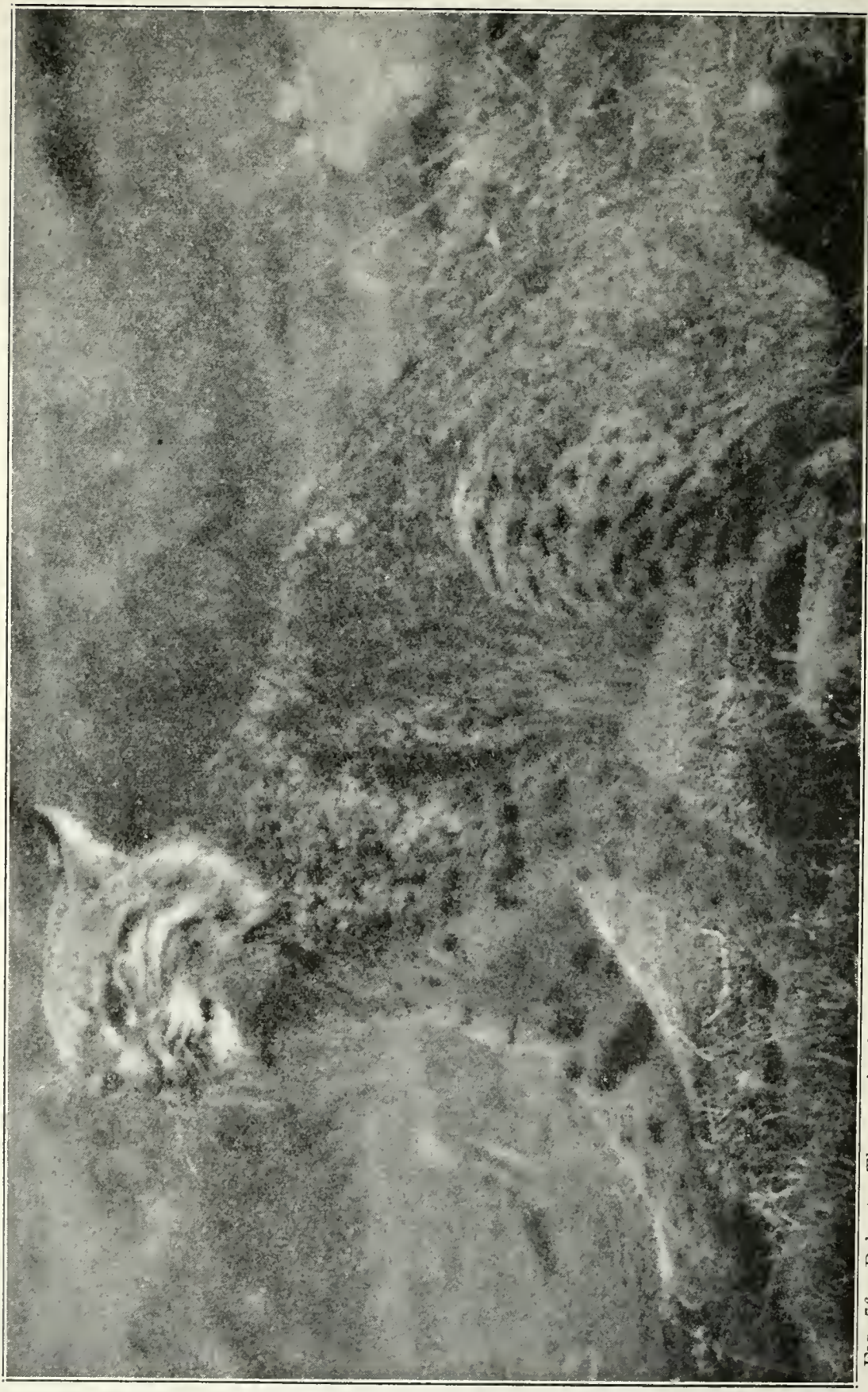


Fig. 76. Bobcat. These animals are to be found in practically all of the wooded and brushy parts of the United States. Photograph submitted through the courtesy of W. C. Jacobsen of the State Department of Agriculture, May 1, 1931.

Bobcats are nearly as active during the daylight hours as at night and for this reason are able to include in their diet a greater variety of food than can strictly nocturnal animals. Birds, such as quail, for example, which are accustomed to roost in trees where they are out of reach of prowling animals during the hours of darkness, become an easy prey for the bobcat when they come down in the morning to forage upon the ground. Joseph Dixon has found from an examination of 218 stomachs that rabbits and harmful rodents outnumber all other food items combined (63%) with beneficial animals (from the human standpoint) amounting to only 27 per cent, and animals of neutral significance amounting to 10 per cent (*Journal of Mammalogy*, 1925, 6, 34–46). Among the beneficial animals destroyed the quail and grouse are probably the most important, and there is no denying that at times the bobcat may become very destructive to these birds, and to others as well. Like all cats it makes up for its short wind and mediocre powers of smell by an extraordinary ability to conceal itself even in places where one would think there was no cover, and by its lightning-like spring when it has crept within reach of its prey, and this makes it a particularly dangerous enemy for birds. A vivid description of such hunting tactics is to be found in an article by Jim Mast in the *American Trapper* for January, 1931. It is very seldom given even to the oldest woodsmen to witness one of these animals hunting, but Mr. Mast was able to observe the cat from the beginning of the performance to the end and state that in the final spring it dived at least eight feet through the air to land on the rabbit which it had been stalking. H. H. Hunt saw a bobcat capture two mountain quail out of a single covey in this same manner (CALIFORNIA FISH AND GAME, 1920, 6, 37), and Donald McLean records an individual which had eaten six western robins (CALIFORNIA FISH AND GAME, 1919, 5, 160). In stalking it places each hind foot directly in the print of the corresponding fore foot, thus further insuring a silent approach. Other items of food which illustrate not only the variety of its diet but something of its prowess as well, are fish, crayfish, frogs, sheep, poultry, fawns and occasionally a full grown deer. There are some good woodsmen who doubt the bobcat's ability to bring down a healthy deer single handed, but we have several accounts of such happenings which can hardly be questioned. In one case the story of the struggle was plainly followed in the snow. The deer was a yearling of about 100 pounds; the bobcat had attacked it at the throat, and they had floundered together for fifty feet through the snow before the deer went down. After killing it the cat had eaten some from one of the hind quarters and then had covered the carcass all over with snow except for the head. There were no tracks of any other animal in the vicinity (Young, S. P. 1928, *Journal of Mammalogy*, 9, 64–65). The average weight of a full grown bobcat, by the way, falls between twenty and thirty pounds, although there is one record of a bobcat trapped by S. M. Wiley, having attained the very unusual weight of nearly sixty pounds (CALIFORNIA FISH AND GAME, 1928, 14, 173).

Cats are hunters the world over, living on fresh meat which is preferably, although not necessarily, their own kill, and to this rule the bobcat is no exception. The best bait according to Jim Mast

(*American Trapper,* 1931, 3, 14–15) is a bit of rabbit fur, or a bird wing, which will move a little in the wind when hung above the sets and thus attract the quick eye of the cat. Stock trails in the vicinity of scrubby brush or rocky places make good locations for sets, and the traps may be set just to one side of such trails—so as not to be sprung by the stock—with the bait hung about two feet above. It is better to use two traps, with the springs running parallel to the cat's trail as he approaches the bait, rather than cross ways, and if there is much danger of their being sprung by rabbits it is a good plan to run a thin dry redwood stick under the pan, with its two ends resting on top of the jaws, so that a moderate weight will be required to spring them. Redwood sticks of this sort, if perfectly dry and shaved down to the size of a very thin lead pencil, should break every time under the weight of a bobcat. A rock or a small piece of brush can be used where necessary to guide the animal to the traps and prevent him from approaching the bait from some other direction. Another type of set can be made by placing the bait in the back part of a rock crevice, between the roots of trees, or in V-shaped openings in thick brush, with the two traps set one close behind the other at the entrance of the V, but this type of set does not catch the eye of the bobcat as readily as the other. In any case the bait should be renewed every day or two so that it will be continually fresh. Quail are said to make the most attractive lure but the wing of an old hen, or in fact nearly any freshly killed animal will work. No. 2 double spring traps are quite strong enough to hold bobcats and are the best size to use, but a No. 3 can also be used satisfactorily.

Scents do not seem to work as well as bait for these cats because of relatively poor powers of smell. Fish oil is the best of the ordinary scents for this species and is easy to make, the procedure being simply to cut a fish into small pieces and place in an uncovered mason jar in the sun for a few days; a foul smelling oil will form on top, and this should be poured off and saved. A variation of this, as recommended by the Pennsylvania Game Commission is the following:

One pint of fish oil (made as above), 1 oz. oil of anise, 1 oz. oil of rhodium, 1 oz. pulverized asafoetida. Mix together in a bottle and shake well before using. Oil of catnip is used by the U. S. Biological Survey for bobcats and mountain lions and is probably the best of all, but is very expensive. In putting out any scent, place a drop or two on the bush or rock to which the bait is fastened but never get it on the traps.

Excellent directions for preparing and dressing skins at home are to be found in two published articles, one by Joseph Dixon in the July issue of *Forest and Stream* for 1917, and the other by Ned Dearborn in a leaflet entitled "Trapping on the Farm" (1919), which may be secured from the U. S. Biological Survey, Washington, D. C.

GAME REMINISCENCES OF YESTERYEARS

By Walter R. Welch

ALTHOUGH I was born at Olema, Marin County, my first recollection of wild life begins in the Sunol Valley, Alameda County, in 1866. At that time quail in abundance were to be seen throughout the whole valley. Other game, such as rabbits, jackrabbits, doves, tree squirrels, and deer were plentiful, and Alameda Creek, on the banks of which we lived, was an unobstructed stream alive with trout and steelhead.

In 1867 we moved to a ranch located between "Spanishtown," now called Half Moon Bay, and San Gregorio, on the coast side of San Mateo County. There I saw quail by the thousands everywhere; every canyon, gulch and ravine contained quail, rabbits and deer, and the whole country seemed to be alive with them; the streams were full of trout, and what at that time were commonly called "salmon" and "silversides" (steelheads).

During the winter months ducks were to be seen in large numbers in the lagoons along the beaches, and flocks of geese would alight in the grain fields along the coast.

The farmers wives and children, and other people trapped the quail, and market hunters shot them and shipped them to the San Francisco markets, where they found ready sale—with the result that from the early sixties to the late eighties quail traps by the hundreds could be seen throughout the entire country.

In 1872 we moved to a fruit orchard in the vicinity of Mayfield, Santa Clara County. At that time, where Stanford University and Palo Alto are now located, were unbroken fields covered with live oaks, chaparral, manzanita, and Toyon berry bushes, alive with quail and other small game, and countless thousands of song birds of every variety to be found in that part of the country were to be seen throughout the entire Santa Clara Valley.

In those days there were only a few small orchards in the valley, and although the birds did at times destroy a few cherries and peaches, there was very little complaint about the destruction of fruit by birds.

About 1875 it became a fad among the school children to collect bird eggs. Practically every small boy and some of the girls throughout the Santa Clara Valley collected bird eggs, and thousands upon thousands of the nests and eggs of the birds of every variety were wantonly destroyed. Some of the boys would put the eggs in cigar boxes, others would string the egg shells like beads and bring them to school, where they would trade back and forth. Out of the thousands of bird eggs collected by children at that time, I do not know of any beneficial use that was made of them, with the possible exception of a few that were secured by Mr. Chase Littlejohn, of Redwood City, to add to his scientific collection.

During the early seventies the marshes surrounding the Bay of San Francisco were practically in their virgin condition. No attempt had been made to reclaim them, and from Alameda, on the east side of the bay, and Hunter's Point on the west side, to the head of the bay at Alviso, the marshes were in their natural condition, and during the fall and winter months were inhabited by millions of ducks, geese, shore birds and other waterfowl of every variety.

Adjacent to the marshes along both sides of the bay were large grain fields, and very little land had been set aside for other purposes. The ducks remained on the bay during the day and went to the grain fields to feed at night. On moonlight nights one could see countless thousands of ducks in flight to and from the grainfields. Hunters with every kind of firearm, from old muzzle-loading army muskets to late model breech-loading shotguns, would post themselves in the grain fields and shoot the ducks as they passed over.

It was about this time that I became afflicted with what is commonly called "duckitis," and aspired to become a market hunter. I had done considerable shooting at night, and in order to secure money with which to buy ammunition, had sold my ducks. In the fall of 1879, in partnership with another party, I purchased a scow sloop, and having heard of the great number of ducks in the Delta section, we prepared to go to the San Joaquin river for the purpose of hunting ducks for market. The sloop was 42 feet long, over-all, with a beam of about 11 feet, and was principally a house boat, as the cabin, which was comfortably arranged with four berths, and lockers in which to put things, covered almost the entire craft.

As part of our hunting equipment when we started for the river, we also had five small boats, viz, two "tule splitters," two "scull boats" with which to hunt ducks, and one sail boat to be used as a shipping boat; 300 wooden duck decoys, one No. 4 and one No. 6 caliber muzzle-loading shotguns, two No. 10 and two No. 12 caliber breech-loading shotguns, two 45-70 caliber Winchester rifles, 100 pounds of powder, 500 pounds of shot, 10,000 shotgun wads, 5000 "primers" or caps, 500 brass shotgun shells, and food supplies sufficient to last us for three months.

When we arrived at the river we found that the levees had been broken by the high water of the previous year, and that the whole country known as the "Yolo basin" and the "Delta section" had been overflowed, and from Rio Vista up to San Joaquin City was under water. As the conditions were ideal for waterfowl of all species, the whole country was alive with thousands—yes, millions of ducks, geese, and every variety of shore bird.

At that time there were not more than eight or ten market hunters in the entire section, and as the only means of transportation was by river steamers, only a few hunters came in from the large cities. Occasionally a small party in a sail boat would arrive for two or three days shooting. It required a week to make the trip from San Francisco and return.

It was a rule among the market hunters to start shooting at daylight and stop about noon. If we had not shot 200 to 250 shells by one o'clock we did not consider it a very good day. If shooting

conditions were good we would kill from 100 to 200 ducks apiece per day.

It was our practice to hunt on the river from September until about the last of November, then return to the bay region where we would continue to hunt ducks until the first of March; after that time we would begin to shoot shore birds, grebe, and seals of which there were large numbers. We hunted grebes for their skins, and seals for their skins and oil, which we sold to the tannery at Redwood City. About the first or middle of June we would quit hunting and lay up our boat until the next fall.

During these years there were a few around the bay who shot ducks irregularly for market. The outfit owned by myself and partner, and another on the east side of the bay comprised the sole lot of professional hunters.

We received from 75 cents to $3 per dozen for ducks; from $1 to $4.50 per dozen for geese, and from 35 cents to 75 cents per dozen for shore birds, according to kind and size, less 10 per cent commission, drayage and costs of transportation. Grebe skins brought us from 35 cents to 75 cents each; seal skins $1.50 each, and seal oil 75 cents per gallon.

During the holiday season the prices for wild duck, geese, shore birds and other game was lower than at other periods of the year.

During these years the prevailing prices for quail were from 75 cents to $1.50 per dozen; rabbits $1 to $1.50 per dozen, and venison 10 cents per pound.

When I was on my second trip to the delta section I ran across a duck preserve for the first time. I do not know but what this was the first one created. It was operated by a market hunter who had rented an island for duck hunting purposes in the vicinity of Rio Vista. Subsequently, duck preserves began to spring up in the Suisun Marsh and elsewhere throughout the State.

This growth in duck preserves was due no doubt to improved means of transportation. Prior to the late eighties transportation on the peninsula was limited. There were only two trains in the forenoon and two in the afternoon between San Francisco and San Jose. The only way hunters could get to the lower end of the bay for an early morning week-end shoot was to sail down by boat or drive down by horse and buggy.

During the late eighties the Southern Pacific Company put on a "Hunter's train." They also installed one going up to the Suisun country. As soon as these trains were put on hunters flocked in from San Francisco and other large cities, and where formerly one could see but a dozen hunters on Sunday one could now see hundreds in every direction, and as there was no bag limit on ducks, geese, shore birds or quail, the hunters shot them indiscriminately. I have seen hunters come off the marsh in the vicinity of Belmont, with all the rail and ducks they could carry, and it was not unusual for a hunter to kill from 50 to 150 rail during a day's shoot in that locality.

It was not until about 1892 that there was any perceptible decrease in the supply of game. About that time we began to notice that the supply of all our game was fast diminishing, and that it was becoming

scarce. In conversation reference was made to this fact and those most interested began to discuss ways and means of bringing about the enactment of laws for the better protection of game.

In 1900, at the suggestion of Governor Henry T. Gage, the State Board of Fish Commissioners called a convention to be held at San Francisco during May of that year for the purpose of recommending game laws to be passed by the Legislature, and requested the supervisors of each county within the State to send two delegates to attend the convention. I attended this convention as a delegate from Santa Cruz County.

In 1901, and as the result of this convention, laws were enacted which fixed a bag limit of three male deer per season, a daily bag limit of 50 ducks, 50 doves, 25 rail, 25 snipe, and 25 quail; prohibited the sale of quail, deer meat and hides, and the killing of does or fawns, or the possession of any deer hide with the evidence of sex removed. These laws are considered to be the first constructive, progressive and beneficial game laws to have been enacted in California.

During the early days predatory animals, such as coyotes, wildcats, foxes, coons, skunks, etc., were plentiful, and as a boy I used to trap them in box traps. Once in a while one of these animals would become a little bolder than the others, and get into the chicken yard. Then the ranches would set a few steel traps, and when the animal was caught, would forget about the others.

Occasionally a calf would stray away from the other cattle and be killed by coyotes, but there was no particular complaint made about predatory animals, or that they were destructive to game. They undoubtedly lived on rodents, as the country at that time contained a great many.

Turning to the larger mammals, such as bear—I well remember seeing two bear, when a boy, which I have every reason to believe were grizzlies. In 1878 I saw one in the Big Basin, in Santa Cruz County, and in 1879 I saw another in the borders of the timber in the Alpine District, through which the Pescadero Creek flows in San Mateo County.

While on a deer hunting trip into the Big Basin in 1878, I saw a tree in which holes had been bored, and wooden pins driven, thus making a ladder up which to climb to a scaffold built in the tree. I was told by Mr. Ridgeway G. Rowley, who was with me on the trip, that a Mr. Rodgers, who owned a ranch near La Honda, had built this scaffold. On February 24, 1931, I addressed a letter to Mr. W. S. Rodgers, of Boulder Creek, in regard to this scaffold, and on March 5, 1931, received the following letter in reply:

> Dear Mr. Welch—My father, Benjamin Rodgers, who lived on the well known Rodgers Ranch, near La Honda, San Mateo County, from the time he moved into the mountains in 1867, until his death in August, 1884, had much trouble with bears there for a few years at first through their killing some of his cattle during the summer months.
>
> I recall that he succeeded in poisoning one very large grizzly by putting strychnine in the carcass of an animal that the bear had killed. I know of no other incident or adventure that my father ever had with a bear.
>
> Ridgeway G. Rowley was our neighbor there at that time. The only tree scaffold I know of was ereeted by my older brother, the late Charles C. Rodgers, when he first settled on his government claim at "Bull Springs" on the very head waters of Boulder Creek. Before his cabin was built he established an out-door camp, and did not even have a tent, but slept on the ground

under the protecting branches of a large chestnut oak. One sunny morning he was awakened by a nearby noise, and raised up to discover an old female grizzly and two cubs, busily eating scraps he had thrown out from his camp. Brother and the bear looked at each other for a brief time, that seemed like an eternity to the former, then mother bruin gave a disgruntled growl and sidled slowly off into the nearby brush.

That very same day my brother built the scaffold previously mentioned, well up from the ground, and used it to sleep on until such time as he had his cabin finished. That incident took place in 1877. Later during that same summer, brother Charles was riding on horseback along a side hill trail, when two bear cubs jumped into the trail ahead of him. He had a large navy revolver strapped to his saddle and was drawing it, when he heard an ominous growl behind him, and on looking back, saw the mother bear in full pursuit. He quickly pulled his horse to one side, out of the trail, and with a snap and a growl the bear passed to join her cubs and disappear in the woods. This was probably the same bear family that had visited him at his camp a month or more before.

That same summer of 1877 my brother Charles and myself drove ninety head of cattle into the "Big Basin" to bring them through to another year, as that was a very dry season and cattle were starving to death by thousands in the cow counties to the southward. We lost a good many of our herd through the depredations of the bear that summer in the Big Basin.

In looking after the cattle that summer, we several times came upon young cattle that had been killed by bear, and even heard the bear making off as we approached, but they never stood their ground to defend their kill.

For this reason, I concluded from our experiences that grizzly bears were not as dangerous or fierce as their reputation indicated. My conclusion was that they would never show fight except when cornered, or wounded.

As a pioneer for sixty-five years in the Santa Cruz mountains, my near contacts with bears were commonplace. For some eight or ten years after I came to Boulder Creek there were always bear in the Big Basin country, and they even wandered over the ridge at night time on to the Boulder Creek side, but there were no depredations other than I have mentioned.

Early one morning, during the early days, I called on a neighbor, a Mr. Wm. A. Day, whose place was located in a little valley at the headwaters of Boulder Creek, but found nobody in the house. I had hardly time to size up the situation, when here came my neighbor running out of the thick woods just back of the house, very greatly excited and out of breath. As soon as he could talk coherently he explained the unusual situation as follows:

He had a milk cow that was missing the night before, and hearing a noise in the brush at the back of the house he followed it into the woods, thinking it might be the missing cow. Going on, unsuspectingly, he came out on a small opening in the timber on a side hill, still following the imagined cow, when out of the brush at the further edge of the opening came a huge grizzly bear, uttering an unearthly growl, and in turning to run, Day saw not far away two cubs below him. It is needless to add that Mr. Day broke all records in getting out of that neck of the woods and down to where I saw him, as described above.

During the winter months the bear would always disappear, probably going south to a warmer and drier climate (doubtless were hibernating. W. R. W.)

With many thoughts of the "Days of Auld Lang Syne," I am,

Sincerely yours,

W. S. Rodgers.

About 1875 I saw a large bear trap that had been built out of logs, near Bear Gulch, on the top of what is now known as Kings Mountain, west of Woodside, in San Mateo County. I do not know when this trap was built, or how long since it had been in use, but it was in fairly good shape, and I remember that inside the trap were evidences of a bear having been trapped, as one could see where bear had scratched and chewed the logs, and tried to get out of the trap door. Men whom I

knew at that time told me that several bears had been caught in this trap.

That at least some of the grizzly bears to be found on the peninsula during the early days lived up to their reputation of being fierce and dangerous, and that they would attack when wounded or cornered, and at times when they had not been molested, is evidenced by the following incidents which occurred in Santa Cruz and San Mateo counties during the sixties and seventies.

A man by the name of Charles McKiernan, familiarly known as "Mountain Charley," and after whom the Mountain Charley grade or road in Santa Cruz County is named, shot and wounded a grizzly bear, and was attacked. Mr. McKiernan defended himself with his knife, inflicting a mortal wound, but the bear scalped him and fractured his skull. A man by the name of Schultheis, after whom "Schultheis Pass" in the Santa Cruz Mountains is named, came across Mr. McKiernan lying unconscious on the trail, the grizzly dead beside him, and took him to a doctor at Santa Clara, where a surgical operation was performed and a piece of silver inserted in McKiernan's skull, which resulted in saving his life.

In 1875 a Mr. Waddell, who at that time owned the property now occupied by Mr. Theodore Hoover, at the mouth of Waddell Creek, in Santa Cruz County, and known as the "Rancho del Oso," was fatally injured by a grizzly bear. The following letter received from Mr. Chas. B. Younger, and article published in the Santa Cruz "Sentinel," October 9, 1875, gives a good account of this incident:

Santa Cruz, February 10, 1931.

Dear Walter—I have received your letter of February 9, 1931, relative to Mr. Waddell. I enclose you a clipping which I had. Mr. Waddell's name was William W. Waddell. He was my grandfather.

Yours truly,
CHARLES B. YOUNGER.

The following is the article published in the Santa Cruz Sentinel of October 9, 1875.

On Friday of last week, Mr. Waddell, a well known citizen, went deer hunting with John Bradley, on the gulch above his mill. Not finding any game in that vicinity they concluded to cross the Steele Gulch. On reaching the gulch Bradley proceeded to the left and Waddell to the right.

Waddell came across the remains of a deer, which he supposed was killed by a lion. He kept going up and soon came to a narrow ravine, washed out 6 or 7 feet below the surface, and his dog took up the trail. Waddell heard the dog bark, and supposing it had the lion at bay, took a seat to await results. But a few minutes elapsed before the dog came bounding out of the ravine and made straight for his master, and before Waddell had time to comprehend the situation, a grizzly that had pursued the dog, had him by the thigh. The dog in the meantime was not idle, and at once made a rear attack on the bear. This had the effect of making the bear let go his hold of Waddell, and both dog and bear disappeared as rapidly as possible.

When they went out of sight, Waddell finding himself in a crippled condition, fired his gun as a signal to Bradley to come to his assistance. Bradley, who had been close enough to hear the dog bark when the animal first pursued the bear, and hearing the bear growl, and the shot, supposed that Waddell had fired at the bear, and coming up, asked: "Waddell, did you get him?" Waddell replied, "No, but he got me."

Bradley found Waddell's thigh was badly lacerated and bruised. The wounded man had to be taken home on a horse. Dr. C. L. Anderson was sent

for and dressed the wounds, which were of such a nature that the injured man sank rapidly, and died on Thursday, the fifth day after the attack.

He was the very soul of honor and fair dealing, and the grief of his tragic and untimely death is universal.

Mr. Waddell was born in Mason County, Kentucky, January 31, 1818, coming to California in 1851, where he finally settled at Williams Landing. He owned a sawmill at Rincon, and one on the Branciforte, and in 1862 moved to Waddell's creek, where he built a saw and planing mill.

The funeral took place from the Charles Younger residence, his son-in-law.

The foregoing story shows that Santa Cruz County in early days was infested with lions and grizzly bears.

That the grizzly bears to be found on the peninsula during the early days would and did attack at times, and without having been molested, is indicated by the incidents related in the following letter I received from one of the pioneer residents of San Mateo County:

Palo Alto, March 14, 1931.

Dear Friend Walter—During the late sixties a Frenchman by the name of Barbone, while fishing in Pilarcitos Creek, in San Mateo County, came onto a grizzly bear. He turned and tried to make his getaway, but the bear was too quick for him, overtook him and grabbed him by the thigh. Barbone succeeded in breaking the bear's hold on his thigh, but it grabbed him by the arm, and he grabbed the bear by the nose with his teeth, whereat the bear let go and so did Barbone, and both started in opposite directions. Barbone's injuries, while serious, were not fatal.

Subsequently this bear began to kill cattle on the Dennison Ranch, located near Half Moon Bay, and was finally killed by my uncle, Patricio Soto, with with a gun used to shoot whale, that he had secured from a whaling station then located on San Pedro Point, near Half Moon Bay.

Uncle dug a hole in the side of the hill, baited the bear and when it came, fired one shot at it. The bear was wounded, fell into a gully, crawled into the woods and was never seen or heard of after that.

During the fifties a man from Searsville met a grizzly bear and two cubs in Bear Gulch. The bear attacked him, bit him and mauled him around until he fainted dead away. The cubs ran up the gulch and began to cry, whereat the mother bear covered the man with brush and leaves and went away. When the man regained consciousness he made his way to our old adobe home near Woodside, where my mother doctored his wounds and took care of him until he recovered.

During the late fifties my father killed a very fat steer and hung the meat in an oak tree which stood in the back yard of our old adobe home at Woodside.

Father rendered out the fat from the steer and put it in a small keg. That night, four grizzly bears came into the yard after the meat. As it was a clear and beautiful moonlight night, father sat in the dining room and watched the bears roll the keg around, and turn about, eat the fat. Finally father went to bed and left the bears fighting it out.

Another night a grizzly bear came and killed an old sow and all of her pigs, and ate part of the sow. As I witnessed this incident myself, you can bet that I was never to be found out of the house after dark, after that.

At one time grizzly bears were to be seen where the town of Palo Alto is now located. Early one morning during the fifties, a young man who made his home with my uncle, Patricio Soto, who lived at that time in that locality, was sent out to drive in the cattle and ran across a half grown grizzly bear cub. He tried to lasso it, but as he did not know how to handle a riata, lost out. Then all the boys saddled their horses and went after the cub. They tracked it to San Francisquito Creek, where they lost its tracks—consequently there was no lassoing of bear that day.

All of the above are facts.

Yours truly,

JOHN LUCAS GREER.

R. 1, Box 795, Palo Alto, California.

During the eighties grizzly bears had become scarce in San Mateo, Santa Clara and Santa Cruz counties, and what proved to be the last of the species to be found on the peninsula was killed by O. S. Blodgett, on the Blodgett Ranch, on Ben Lomond Mountain, west of Ben Lomond, in Santa Cruz County, in November, 1886. The following letter received from Mr. Blodgett, who is now assistant county assessor of Santa Cruz county, gives a good account of that incident:

Santa Cruz, January 13, 1931.

Friend Walter—Regarding the killing of the bear to which you refer—it was in the fall of 1886, during November, I think—that I killed the bear. This bear had been killing stock, principally hogs, around the neighborhood, and finally came one night and took a 300 pound hog out of our pen—one we had been fattening. The dogs annoyed the bear so it was compelled to leave the hog, and we found it covered with leaves and brush a short distance from the pen. Thinking the bear would eventually come back for the hog, we tied up the dogs and watched for three or four nights without success. On the night the bear returned we had given up watching and were about to go to bed, when the dogs commenced to bark, and thinking they had scented the bear, I took my gun—an old muzzle-loading shotgun—and went out. As I approached the spot where the hog was buried, I heard the bear coming through the brush, and in an effort to get a better shot I crawled to the corner of the fence and we met. The bear reared up and I aimed for the head and fired. I was lucky enough to hit the bear in the left eye, and the slug went clear through and killed it instantly. I was so close to the bear that the powder burned the hair around the eye. It was an old female, gray around the muzzle, and weighed just 642 pounds dressed. I sold the meat to the Chase Market at Santa Cruz for 10 cents a pound, and the hide for $25.

I didn't save any part of the bear, for which I have since been sorry, as it proved to be the last grizzly killed in this section.

Yours very truly,

O. S. Blodgett.

While the early day destruction of game birds and animals was what might now be called wanton, it was not so considered at that time. During the early days information relative to the value of game and wild life in general as a natural resource and asset of the State was not available, nor was any effort at that time made to conserve and protect the supply of wild life, such as are now being made along those lines.

I think there is one salient cause for the present rapid decrease in the once abundant supply of wild life in this State upon which we all agree, viz, lack of proper protective fish and game laws, the former sale of game of all species in the open markets—thus placing a bounty on its destruction—the encroachment of civilization and the increase in population, coupled with the use of modern firearms, improvement of highways and roads, the present means of rapid transportation to and from the game fields, lakes, rivers and streams, and the indiscriminate scattering of thallium and other poisons used in rodent control.

I will not undertake to suggest what might benefit fish and game conditions, or result in better protecting the supply of wild life at this time, except to say that efforts should be made for the enactment of not more, but better fish and game laws; laws with "teeth in them" so to speak, and that these laws be strictly enforced.

Some people do not agree with me in the statement that "Legislation plus Education equals Conservation." Some men would

reverse that statement and say "Education plus Legislation equals Conservation."

If we would protect and conserve the present supply of wild life in this State, it is my opinion that we must legislate first and educate later—whether the people realize and appreciate the necessity of and approve such action or not. Otherwise, there will be very little, if any, wild life left to legislate for.

Those who appreciate the value of a supply of wild life to the people, and who are familiar with the conditions as they exist at the present time, should put their shoulders to the wheel in an endeavor to have enacted laws that will afford wild life better protection than it now receives, otherwise it will be too late and the opportunities afforded for free hunting and fishing such as I was able to enjoy when I was a boy, and during the early days, even in a modified way will be gone forever.

DEER PROOF FENCES IN CALIFORNIA

By Tracy I. Storer[1] and Gordon H. True, Jr.[2]

THE INCREASING complexities of modern civilization, the increase of our human population, the greater attention to matters of game supply, and the need for more economical practices in agriculture have, in California, within the past few years, focussed attention on the competition between wild deer and cultivated crops. Under the conditions existing in this State in past decades such competition received but slight attention; there was actually much less difficulty in earlier years. But with the changes in the past ten or twenty years the problem has come prominently to the fore.

Several factors are undoubtedly responsible for the present situation. In earlier years agricultural activities were confined more to the lowland areas not inhabited by deer; agriculture is and has been pushing out more and more into the territory normally occupied by deer. Both bucks and does were formerly killed freely in many sections, legally or illegally, so that their numbers were kept down. More efficient patrol and the conversion of numerous private and public areas into refuges where no hunting is permitted are factors which have aided in local increases in numbers. Predatory animals, particularly mountain lions and coyotes, are known to levy toll on deer; great numbers of these carnivores have been killed so that the repressive action of these animals has been lessened, permitting larger numbers of deer to survive. Depletion of some forage areas by overgrazing with domestic stock, clearing of areas normally producing deer browse, restriction of water supplies and successions of dry years have also probably been factors in turning deer to cultivated crops. Once the deer have developed a liking for cultivated crops it is only logical that they should return to such forage, and young deer accompanying the older ones might readily be "educated" to seek forage on man's domains.

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[2] Parasitologist, Bureau of Education and Research, California Division of Fish and Game.

The topographic and climatic diversity of California and the variety of agricultural developments is such that wild deer and agricultural operations will continue to meet over a wide front.

The presence of wild deer in any area adds to the attractiveness of that area. The animals have a strong aesthetic appeal for many people. Our sportsmen are rightly interested in the continuance of a supply of deer which may be hunted. Many farmers welcome the presence of deer on or adjacent to their lands for both of these reasons. But when deer become so numerous or their attacks on cultivated crops so extensive or persistent as to lead to serious financial loss on the part of the farmers the latter logically view the matter in a different light. The problem then seems to be that of devising means whereby both deer and agriculture may continue without serious competition. Various sprays and repellents have been tried, with varying degrees of success; studies on repellents are in progress by one of us (G. H. T.) and will be reported at a later date.

Adequate fencing is the real solution of the deer exclusion problem and it is our purpose here to describe a number of deer proof fences now in use in various parts of California. The information on fences presented herewith has been obtained by the authors from various federal, state and county officials and private individuals in connection with a study of deer damage which we have conducted in our representative capacities; as members of a special Game Depredations Committee of the California State Chamber of Commerce. We wish here to express our appreciation of the aid rendered persons in supplying these data. We individually have not been able to examine many of these fences in detail. There may be other such fences in use in California, knowledge of which would contribute to a better understanding of the problem.

In many other portions of the United States the height of fences to exclude deer is regulated in part by the depth of winter snows. Most of the areas in California where fencing has been used or can be used to advantage are below the snow line so that the height required is materially less. In hilly country where farm property is adjacent to wild land where deer may approach a fence from upslope a slightly greater height will be required than on level land.

Deer are not excluded by a common stock fence of barbed wire, nor can they be kept out by a fence of parallel strands of barbed wire even when the total height is such that they can not jump over it. They are exceedingly skillful in going between strands of barbed wire. A four-point buck, being pursued by hunters, has been seen to go between the strands of a common barbed wire stock fence even when the animal might easily have jumped over the top. Further, deer have been reported to go under fences, at the ground level, when holes of sufficient size have been made by other agencies. It is a matter of report that "a deer will crawl through any place where its head will pass." These statements emphasize the necessity for a fence which is closely fitted to the ground and especially to depressions such as small ravines or stream beds.

The accompanying table gives details of 25 fences now in use in various parts of California to exclude deer. The data have been reduced to as near a common basis as possible. Dimensions are given

in inches except for the spacing of posts which is given in feet. In the column headed "composition" the width (=height) of the woven wire portion is given first, followed by the spacing of the barbed wires. Thus 60″, 8″, 8″, 8″, means a woven fabric of 60 inches, with a space of 8 inches to the first barbed wire, then two more barbed wires at 8 inch intervals, giving a total height of 84 inches. Some fences have a barbed wire at the ground level to discourage other animals from digging beneath the fence. Several fences have been constructed of wooden pickets with pointed tops, either with of without barbed wire above. Local material for posts is often used, the cheapest available; some fencing is carried on conveniently located trees. Posts need not extend above the level of the top barbed wire. Several fences have been built with posts of moderate length on which "extensions" (usually of 2 by 4 inch material) have been spiked to carry the barbed wires above the mesh wire. In the table such posts are marked thus: 72″+36″. Posts are set 24 to 36 inches in the ground and are usually of 4 by 4 inch material. The spacing varies between 10 and 20 feet, usually 12 to 16 feet. Costs are given in only a few instances. In a few cases figures were supplied from which we calculated the probable cost of materials and labor; such cases have a question mark following the figures. Statements as to effectiveness are as indicated by the person reporting on the fence (who often was not the owner but a game warden or other official).

DEER PROOF FENCES IN CALIFORNIA

Owner and locality	Total height, in inches	Composition, width of woven wire and spacing of barbed wires, in inches	Posts				Costs per rod			Effectiveness
			Kind	Total length, in inches	Height above ground, in inches	Spacing, in feet	Material	Labor	Total	
J. Etter, Petrolia, Humboldt County	84-96	72, 8, 8, 8	Redwood	108-120	84-96	15				Satisfactory
O. O'Brien, Willow Creek, Humboldt County	54	24, 10, 10, 10	Oak	84	54-60	12	$0.50			Not deerproof
J. J. Dailey, Burnt Ranch, Trinity County	81	43, 10, 12, 14; b. w. at ground	Oak	120	84	12	.90			Complete
J. J. Dailey, Burnt Ranch, Trinity County	82	72, pickets, 5, 5		120	84	12				Complete
O. B. French, Hyampom, Trinity County	72	72, pickets	Cedar	96	72	12			$1.50	
Dr. Barr, Hyampom, Trinity County	84	72, pickets, 12	Cedar	96+36	72	10			1.50	
J. Gummers, Covelo, Mendocino County	84	60, pickets, 12, 12	Oak	72+48	48	12		$1.00		Complete
A. Carpenter, Covelo, Mendocino County		32, 6, 8, 10							2.50	
E. Dutton, Ukiah, Mendocino County	90	66, 8, 8, 8	Redwood	96+24	72	12				Very successful
L. E. Crawford, Ukiah, Mendocino County	90	74, 8, 8	Redwood	96	72	12				Very successful
E. M. Gordon, Middletown, Lake County	64	48, 8, 8; b. w. at ground	Steel	96	72	12				No control
T. Petrini, Hacienda, Sonoma County	84	60, 8, 8, 8	Redwood	96+24	72	12				Complete

Morris, W. Smith, Cloverdale, Sonoma County	----------	60, 6, 6 + 6 (6 on hill)	Wood	84-96	72-89	16½, one picket between	1.08	----------	----------	Perfect control
N. Livermore, Calistoga, Napa County	96	96, lightweight, 4 mesh	Trees	120	96	----------	----------	----------	----------	Complete
E. C. Phelps, Stonyford, Colusa County	60	60, pickets	Cedar Pine	84	60	7-9	----------	----------	----------	----------
R. J. McGarra, Adin, Modoc County	96	58, 6, 8, 10, 12	Cedar	72+36	48	16	1.44	.45	1.89	Practically complete
F. Baldsehun, Georgetown, El Dorado County	72	48, 8, 8, 8	Juniper Cedar	96	72	10	1.12	.30	1.42	Complete
Haslam Ranch, Sonora, Tuolumne County	60	32, 8, 10, 12	Cedar	78	60	12	----------	----------	----------	For two years, protecting young orchard
C. Reed, Oakhurst, Madera County	72	60, 12	Oak	108	78	12	1.00	.40	1.40	Complete
J. E. Foster, Dunlap, Fresno County	80	50, 5, 5, 10, 10; b. w. at ground	Cedar	84+24	60	10	1.00	.75	1.75	95% successful
Girls Collegiate School, Glendora, Los Angeles County	96	8 barbed wires, 12, apart	Steel	120	96	20	1.60	.60	2.20	Fair
Hare Star Ranch, near San Juan Capistrano, Orange County	60	6 barbed wires, 10, apart; 2 b. w. on offset	Redwood	108	84	16	----------	----------	----------	Little success
C. C. Pankratz, Orange County	62	54, 8	Redwood	108	78	16	74	----------	----------	Complete
B. Simmons, Japatul, San Diego County	71	16+50 hand-made mesh; b. w. at top	Redwood	96	78	18	.80	----------	----------	Complete

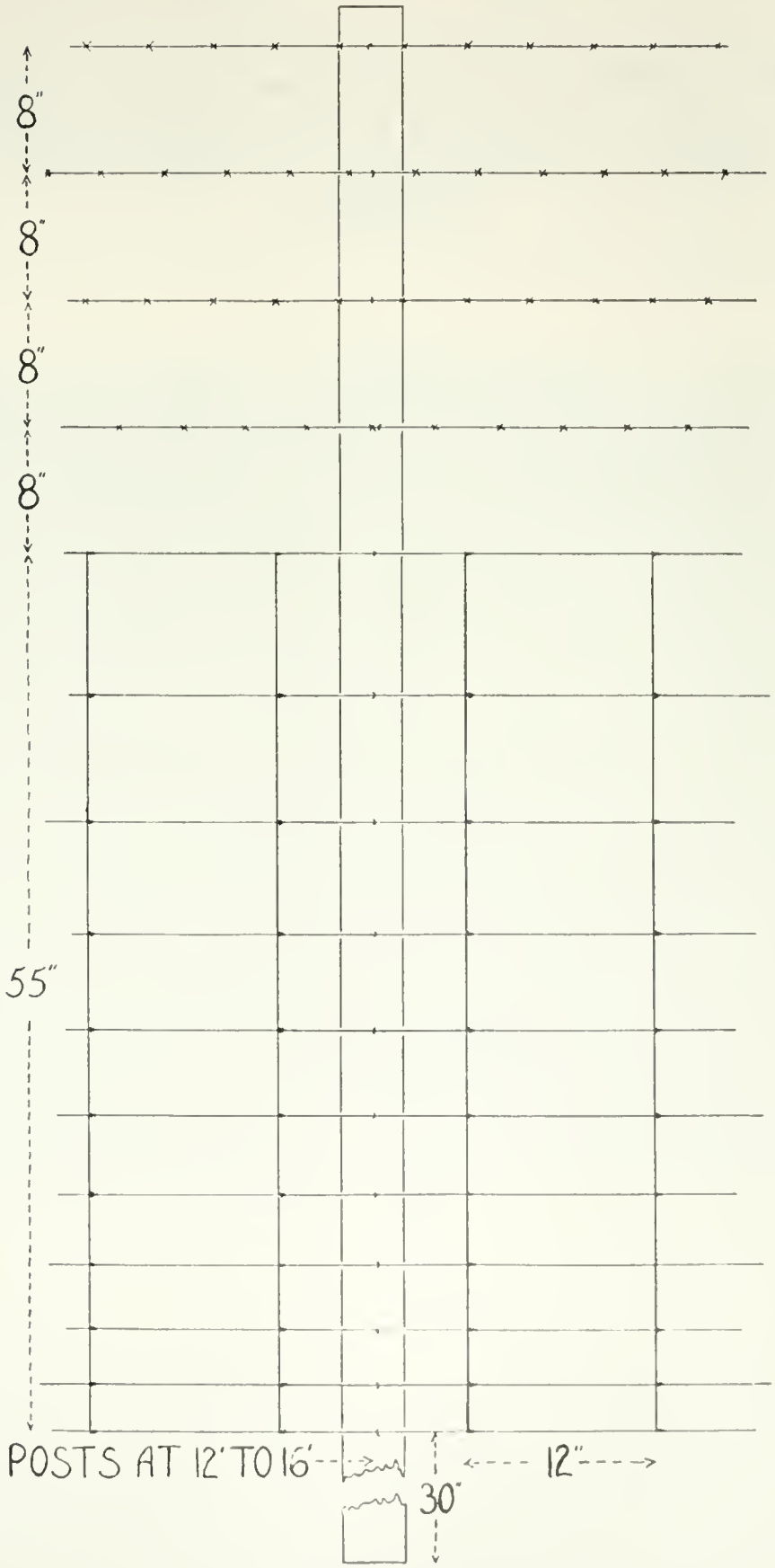
From the data here assembled we conclude that a deer proof fence in California should be between seven and seven and one-half feet in height. Such a fence can be constructed of wire mesh 55 inches in height (11 horizontal strands with vertical stay wires at 12-inch intervals), surmounted by four barbed wires at 8-inch intervals, and supported on posts 4 by 4 inches by 10 feet in length, set 30 inches in the ground and spaced 12 to 16 feet apart.

Current prices, f.o.b. San Francisco (1930) for materials are approximately as follows:

55-inch woven wire	$0.40 per rod
4 barbed wires (@ .04 per rod per strand)	.16 per rod
4″ x 4″ x 10′ redwood posts	.30 each

Staples, corner posts, braces (if and where necessary), gates, freight, hauling, and erection costs are to be added in computing the cost of a given fence. These items would vary according to locality within the state and according to local conditions.

The accompanying figure indicates the type of fence here described.



A type of deer proof fence.

SOME NOTES ON THE BIRDS AND ANIMALS OF THE LOS BANOS DUCK REFUGE WITH SPECIAL REFERENCE TO PREDATORY SPECIES

By E. L. Sumner, Jr.

(With nine photographs by the author.)

THE LOS BANOS DUCK REFUGE, near Los Banos, Merced County, California, is in many ways ideal for a study of wild life since it combines a flatness of terrain, permitting observation in all directions, with a fauna which is much more varied than that of most flat countries. The cause for this is found in the flooded lands and waterways which permit the growth of a great variety of aquatic and semiaquatic plants, with their associated birds and animals, in a region which in an earlier day was for the most part an alkali waste, supporting the limited assemblage of species which are typical of desert habitats.

From the standpoint of any one working upon predatory animal problems the country around about Los Banos is particularly favorable because the nesting sites and places of concealment suitable for the majority of such animals are confined to the few trees which grow in thin straggling lines along the banks of occasional sloughs and canals. On the Los Banos Duck Refuge, which covers 3000 acres, the only trees present are with one or two exceptions confined to the banks of Mud Slough, a sluggish stream which meanders the length of the sanctuary. These trees are willows, many of considerable age, and they offer cover for the 'coons and little spotted skunks which live on the frogs, rabbits and birds found along the stream. It is particularly the predatory birds, however, which are affected in their distribution by this sparsity of trees. As a rule, predatory species of no matter what kind tend to space themselves out over a countryside with considerable gaps between. For example, we seldom find more than one pair of eagles occupying a mountain side, or more than one pair of nesting red-tail hawks for every square mile of suitable territory, and the reason is that each pair must have a piece of territory large enough to supply food for itself and young. Competition among predators, then, is normally for food. In the Los Banos area, however, we have an usual reversal of conditions due to the limited extent of the tree zone. Food in the shape of gophers, ground squirrels, mice and rabbits is abundant for miles in every direction, but roosting and nesting sites are at a premium. Competition here is "for space to sit on." A particular streteh of some two and a half miles along Mud Slough which is being studied at the present time supports four pairs of red-tails, five pairs of horned owls, and at least one pair of barn owls—a coneentration of birds of prey which I have run across in no other section of California.

Such large numbers of meat-eaters should presumably have some sort of influence upon the numbers of local game and nongame species here, and the studies which are being carried on are for the purpose of finding out whether this influence is beneficial, as some naturalists contend, or harmful, as a great many others have declared.

Any study of animal interrelations such as this entails a vast amount of preliminary work in order to attain a grasp of the complicated and often perplexing factors involved. The work began in July, 1930, with a general survey of the whole refuge, which included a detailed map of all waterways, and censuses of what were thought to be the more important food animals, namely mice, squirrels, cottontails

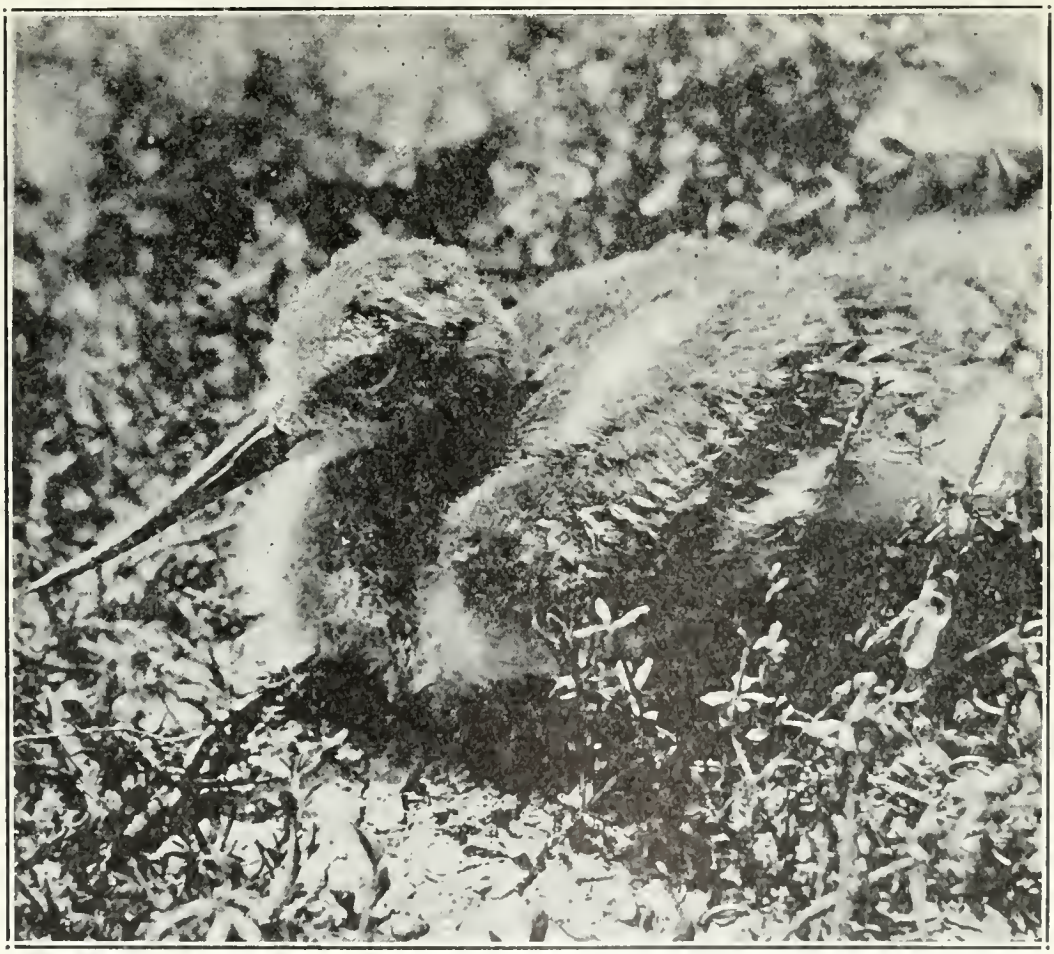


FIG. 77. Young avocet about ten days old at the Los Banos waterfowl refuge. This land is a regular paradise for many species of bird life. February 23, 1931.

and jack rabbits. An unusually complete census of rabbits and cottontails was made at this time because of the necessity of destroying the ground squirrels over most of the area in compliance with county regulations, while at the same time it was desired that the cottontails be spared. This meant that every burrow on the entire 3000 acres had to be examined and marked with a flag—white for ground squirrels and red for cottontails. At first, sand was sifted about the entrances of all doubtful burrows, which meant that they had to be reexamined on the following day for tracks, but I found that, after practice, occupied burrows of the two species could in most cases be distinguished by the general appearance of the entrance, and in the case of the squirrel

burrows by the locations and number of droppings present. Even so, the work of locating and marking all the holes was a tedious process for it meant driving endlessly back and forth along parallel lines over all those portions of the refuge which are not periodically flooded and for that reason devoid of both rabbits and squirrels. At the end of six weeks, the whole refuge, with the exception of one area in the center, had been covered, and the total numbers of several of the burrowing-inhabiting species estimated as follows:

Ground squirrels	1248
Cottontails	230
Burrowing owls	36
Coyotes	--
Badgers	--

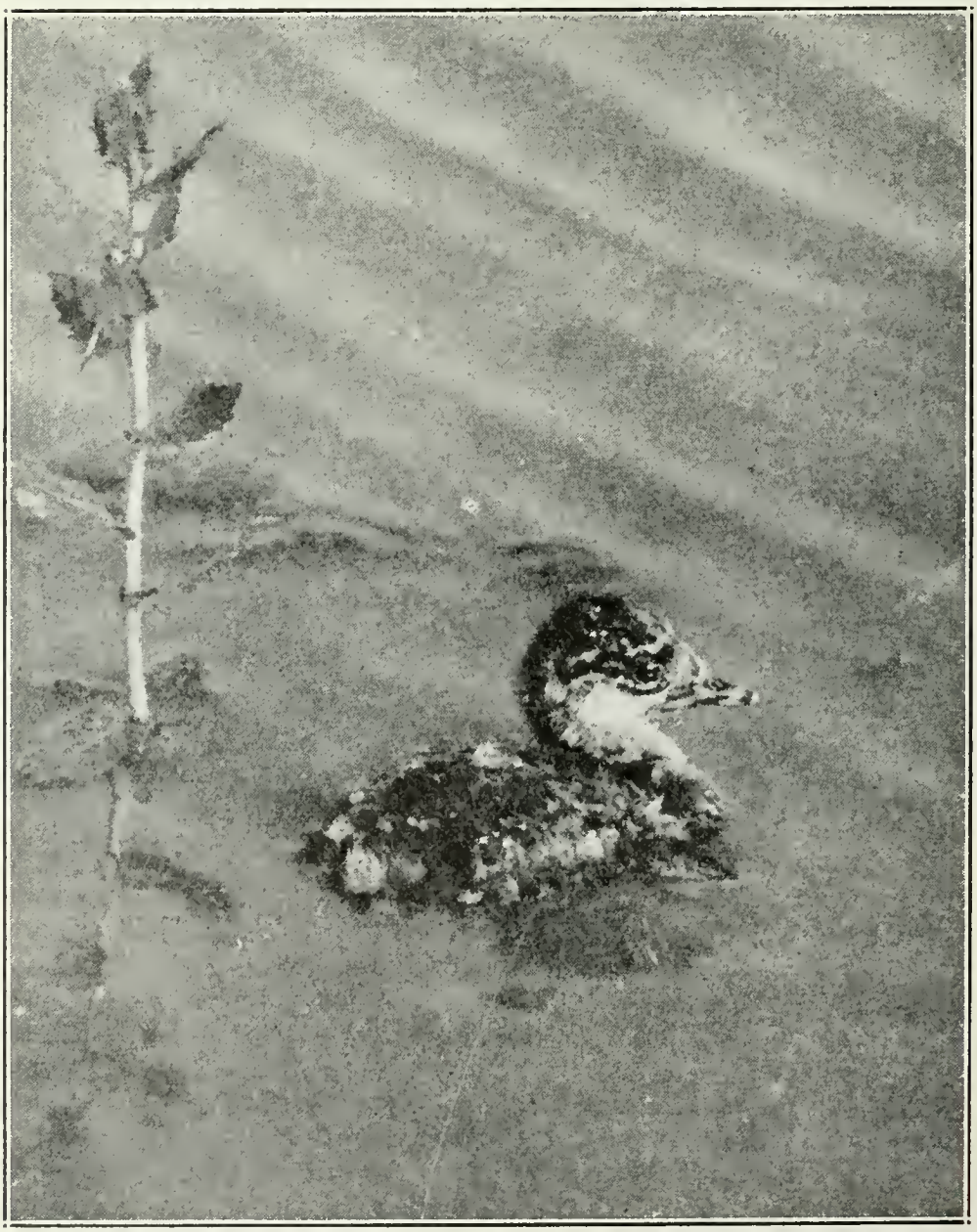


FIG. 78. Young eared grebe showing ability to swim although newly hatched. February 23, 1931.

Since so much time during the early months of the investigation was taken up with preliminary work of the sort described above, data on the activities of the predatory animals have been slow in accumulating at first, and are only just now beginning to show a distinct increase. For this reason it may be that the order of relative importance in which the predators of the refuge are here listed will later be modified. When arranged with the most important first—on the basis of destructive food habits times abundance, we find the birds in order approximately as follows: horned owl, cooper hawk, marsh hawk, red-tailed hawk (?), duck hawk, golden eagle, prairie falcon, short-eared owl, barn owl, sparrow hawk, burrowing owl. It is interesting to note that not one but many red-tails have been observed to eat mud hens, and it may be that in the presence of such an abundance of waterfowl these ordinarily harmless birds forsake their usual habits. The predatory mammals follow: coyote, 'coon, little spotted skunk, weasel, striped skunk, badger (nearly extinct). Some evidence of the destruction of duck nests by predatory mammals—probably 'coons—was seen during July, but the issue was complicated by abnormal changes of water-level, and comparatively little was learned. In his "Survey of the Breeding Grounds of Ducks in California in 1914" (*Condor*, 1914, xvi, pp. 217-239), Dr. H. C. Bryant states that predatory mammals destroyed a very large percentage of all the ducks' nests found, and this question will be studied during the coming breeding season.

One of the most important enemies of game and nongame species is the common gopher snake (*Pituophis catenifer*) which is abundant throughout the lowlands in this section, as many as five of these having been collected during one day on the refuge. I have observed one of these snakes kill a full-grown cottontail in its burrow and proceed to swallow it in spite of the fact that the diameter of the rabbit's head was about 3½ times that of the snake.

In addition to the censuses of predators and the species which form their chief food, two other sorts of records of population have been kept, one covering the ducks, geese, shore birds, and other aquatic birds, and the other covering the land birds. During the summer and fall months it was possible in the case of the aquatic species to count the individual birds on the various ponds and lakes even though they numbered well into the hundreds, but with the rising tide of migration this became increasingly difficult, until by December, when there were sometimes as many as 3000 birds on one lake, with hundreds flying away every moment and others coming



FIG. 79. Nest and eggs of the California horned lark. February 23, 1931.

down upon the water in clouds, it was found most practicable to count the numbers on a unit area of surface and then estimate the total area covered by the birds. A census of the ducks, geese and pelicans, taken on March 1, 1931, is given here as an example of the numbers of birds found on the refuge at this time, it being certain that the figures err on the side of conservatism and not on that of over-estimation.

The ducks at this time of year had begun to migrate from the refuge, while at the same time there had been a tremendous invasion of mud hens, which explains the relatively large figure for the latter. When actually taking a census, the refuge is divided into nine areas and totals made for each, but these have been combined in the following list:

Snow goose	4,502	Widgeon	102
Canada goose (and subspecies)	184	Ducks of various species (not distinguishable)	2,371
White-fronted goose	28	Mud hens	10,015
Pintail duck	107	Canada geese and white-fronted geese (not distinguishable)	305
Spoonbill duck	81		
Mallard	2		
Cinnamon teal	43		
Ruddy duck	21		17,761

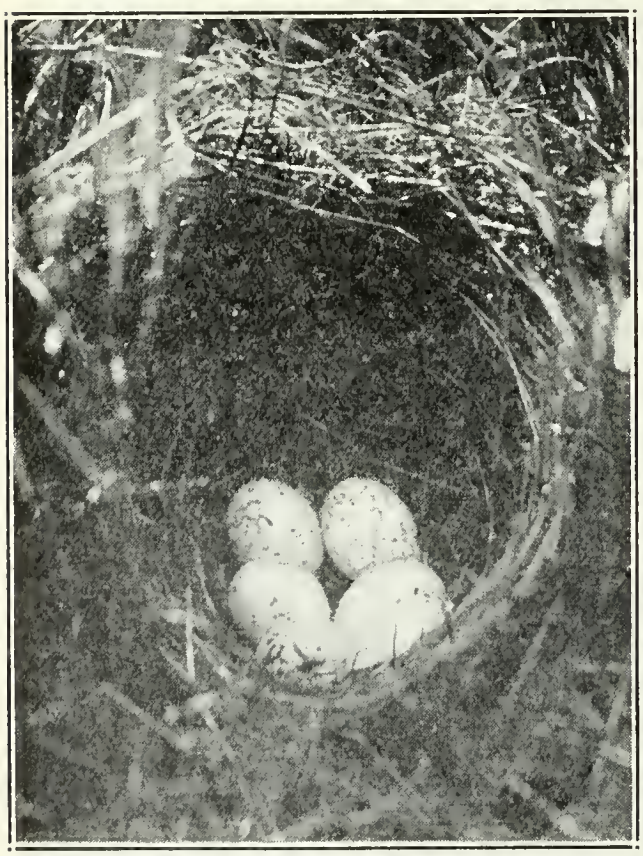


Fig. 80. Nest and eggs of the western meadow lark. February 23, 1931.

In the case of the small land birds, since they are less important in this study, a simpler method of census taking was used. This method is an adaptation by Dr. Jean M. Linsdale of the Museum of Vertebrate Zoology, University of California, of the so-called "Raunkaier's Law of Frequence" used by botanists in computing the frequency of occurrence of plants in a given number of sample plots. As applied by Linsdale to bird species, units of space (plots) of the botanist are replaced by units of time (days of observation), the great advantage of this method over others being that it is "a by-product of field work," no actual counts of individuals being necessary and so can be followed without diverting the attention of the observer from more important matters such as life history studies. (For details see article by Linsdale, 1928, *Condor,* 30, pp. 180–184.)

Censuses of this type require a minimum of about 200 days to approach accuracy and the Los Banos census has not yet reached this mark. Nevertheless, 104 different bird species have been recorded

already and should be increased with the arrival of the spring migrants during the coming year. The mammals are much fewer in number of species, fourteen—chiefly through lack of diversity among the rodent forms, which are poorly represented because of the scarcity of dry land.

Any extended field study such as this brings in its train a scattering of brief notes on the habits of species other than those which are the chief object of the investgiation. A few of these are included here as being of general interest:

Sprig (*Dafila acuta*). A "flapper" of this species which was banded at the Los Banos Duck Refuge on July 31, 1930, was shot on October 29, 1930, at the Middle River Gun Club, Holt, California. Holt is about 48 miles north of Los Banos, or in other words, in the reverse direction from the normal migration route. This tendency of



FIG. 81. Young western meadow larks about four days old on the Los Banos waterfowl refuge. The nest is in a hole in the ground and the young birds are in a characteristic pose for food and plenty of it. February 23, 1931.

young birds to wander in all directions, even northward, immediately after leaving the nest locality has been observed for many species, including owls and black-crowned night herons, but with the exception of a few unpublished records in the files of the U. S. Bureau of Biological Survey, it does not seem to have been noted in the case of young ducks.

Killdeer (*Oxyechus vociferus*). A killdeer which was kept almost constantly under observation from 5.30 a.m. until 9.30 p.m., one day, showed a surprising lack of concern over the duties of incubation. It left the nest of its own accord nineteen times in sixteen hours even though the day was cloudy, sometimes feeding within a foot or two of the nest and at other times flying to the far end of a nearby slough, remaining absent on one occasion for as long as one hour and fifteen

minutes. On another day it was observed to leave its eggs in order to feed even during a drizzling rain, although not for so long a period. Dr. Gayle Pickwell, State Teachers College, San Jose, California, has found that with the exception of egg laying, the duties of the sexes have been reversed, so that it is the female that is aggressive in courtship, while the male constructs the nest, incubates the eggs, and is most

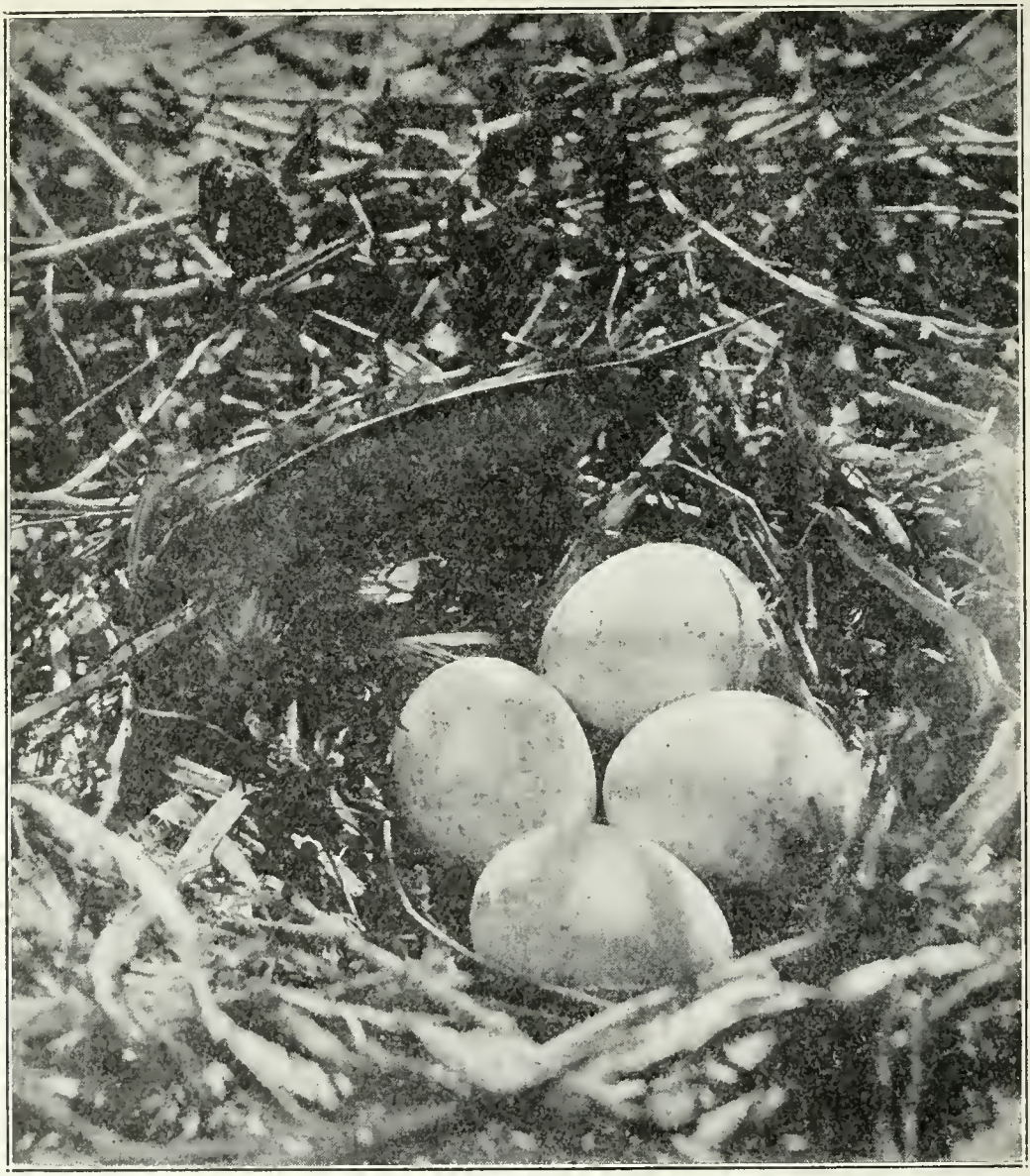


FIG. 82. Nest cup and eggs of a western redtail hawk on the Los Banos waterfowl refuge. February 23, 1931.

solicitous for the young (Pickwell, 1930, *Auk,* 47, pp. 499–507). This particular pair was no exception to the general rule, for it was the female bird which fought and drove away intruding killdeers from adjacent territory, while it was the smaller male which did the major part of the incubating. Twice, however, the larger bird was seen to take the place of its mate on the nest for a brief period—an observation which does not seem to have been made before.

In the case of another nest of this species where the young had just hatched, one of the old birds was seen by Donald McLean, of the

Division of Fish and Game, to walk off with a piece of eggshell in its bill for a distance of thirty feet or more and then fly away with it. Upon examining the nest, we found that with the exception of one small fragment, every vestige of the original four eggs had been removed. Further search disclosed a few scattered bits of shell in a line leading straight away from the nest, and further on a half an egg

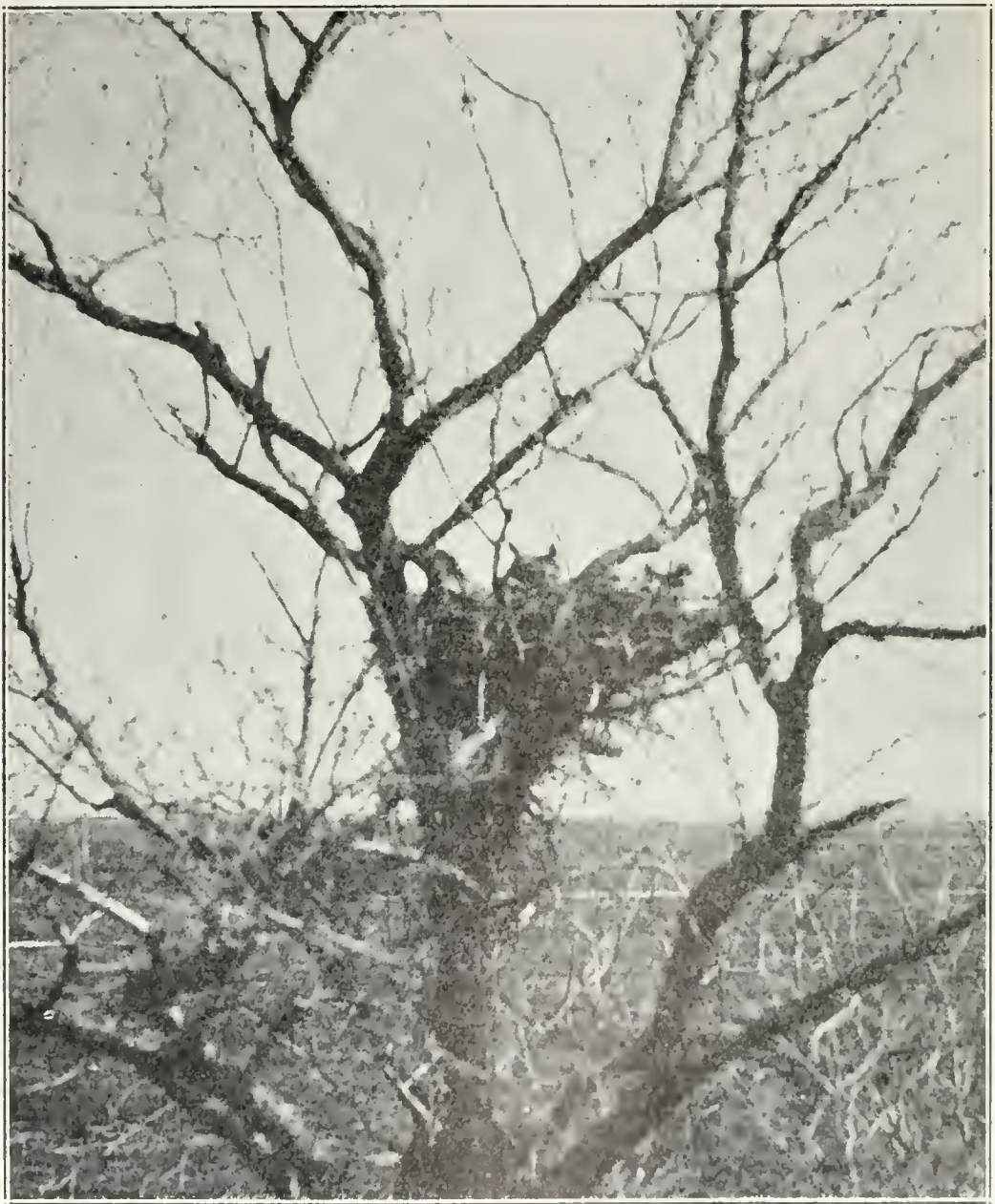


FIG. 83. Nest of the Pacific horned owl with head of sitting bird showing over the edge. Photograph taken on the Los Banos waterfowl refuge. February 23, 1931.

shell, as though the bird had made a number of trips and had dropped some along the way; all told, however, we found hardly enough fragments to account for a single egg.

Western red-tail (*Buteo borealis calurus*). These birds have experienced some trouble this year from the high winds which frequently blow all day long with great force. Two nests, each containing fresh eggs were found blown over during one week and there were

doubtless other casualties elsewhere during the same period. In one case the birds have moved up Mud Slough a third of a mile and are renovating an old nest built during some previous year, both sexes bringing fresh materials and working them into the structure. Another nest, found just outside the refuge boundary, contained four eggs—a very unusual number—and in addition the remains of a freshly killed mud hen. Other birds as well as mud hens have been observed to fall victim to this hawk and a study of its food habits is under way at the present time.

Pacific horned owl (*Bubo virginianus pacificus*). Horned owls appropriate the nests of red-tails for their own use so commonly that their dependence might almost be described as parasitism. Indeed, wherever the two species occur together it is exceptional to find the owls nesting in any other situation. The evidence so far gathered points to the horned owl being the most important enemy of wild fowl on the refuge with the possible exception of the coon.

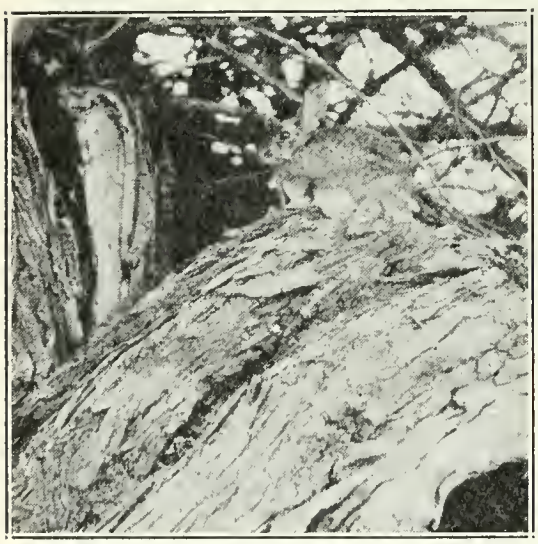


Fig. 84. Cottontail rabbit perched on willow stump 5½ feet above ground at the Los Banos waterfowl refuge. February 23, 1931.

Gambel white-footed mouse (*Peromyscus maniculatus gambelii*). Mice of this species seem to undergo considerable seasonal fluctuation in numbers, being very abundant in the spring, but much less numerous in winter. By trapping individuals with live-traps and punching their ears according to a system of numbering, it has been possible to keep track of individual mice and to ascertain in a general way the distance traveled from home, for they readily enter the traps night after night.

Sacramento cottontail (*Sylvilagus auduboni auduboni*). The cottontails on the refuge are exceedingly tame, and may sometimes be approached on foot to within five or six feet. Individuals which live along the banks of Mud Slough are accustomed to take refuge in the hollow willow stumps when alarmed. One particular rabbit which has been under observation for six weeks spends nearly all its resting hours on a wide flat shelf formed by a bent limb 5½ feet from the ground. This rabbit was so tame that even during the first week, it remained at its post while I took a series of pictures at a distance of fifteen feet.

Cottontails are apparently bewildered by a strong light at night, for if one approaches with a flashlight and can keep them moving away from their home territories and into unfamiliar surroundings they can often be picked up by hand. One individual so caught was found to have large scabs on the shoulders and about the mouth. It was sent alive to the Hooper Foundation for Medical Research and is being studied there at the present time.

San Joaquin jack rabbit (*Lepus californicus richardsoni*). Jack rabbits in the Los Banos district find themselves in an environment not

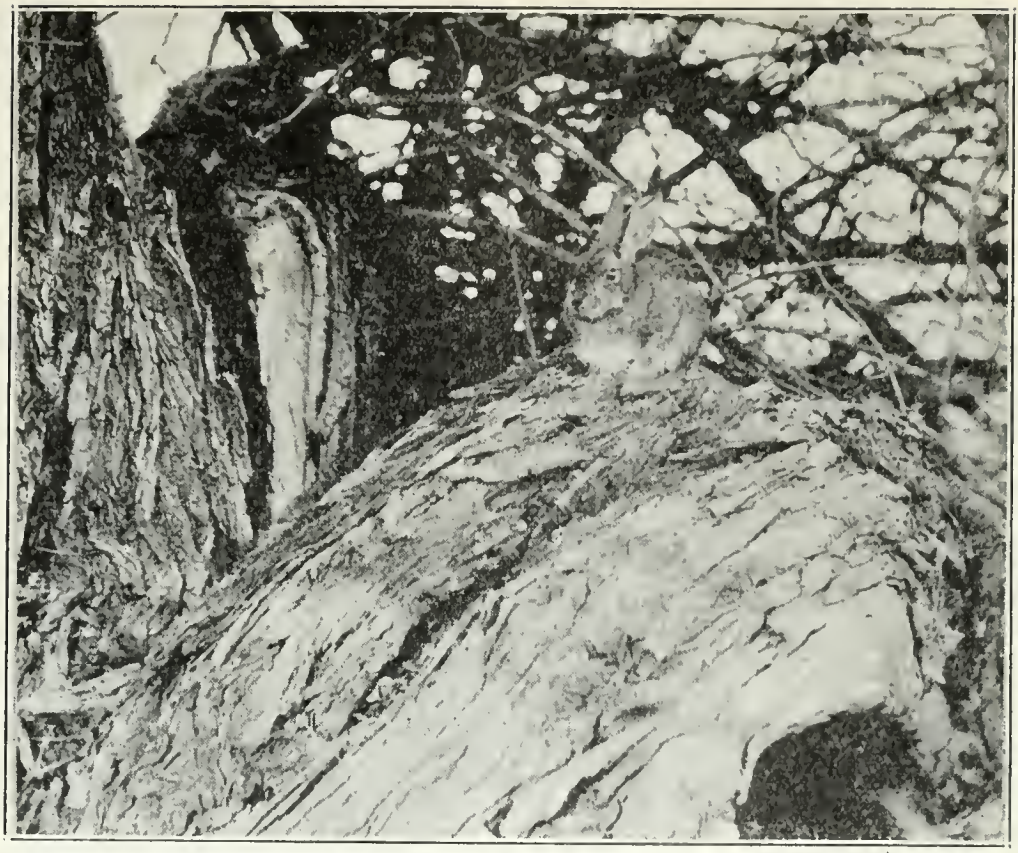


FIG. 85. This cottontail rabbit selected a hollow willow tree for a home at the Los Banos waterfowl refuge. February 23, 1931.

altogether adapted to their requirements of open unobstructed space, particularly when hard pressed by enemies. Usually they are very reluctant to enter water and when cornered on a peninsula will lay their ears back and run past one at top speed rather than cross the shallowest puddle. At times, however, one finds exceptions to this rule, just as with all other reactions customarily made by animals. On March 22, 1931, I saw a jack rabbit, which was 200 yards away and consequently not hard pressed, splash into the water and head directly across a channel where it was more than fifty feet across. For the first few jumps the rabbit made good

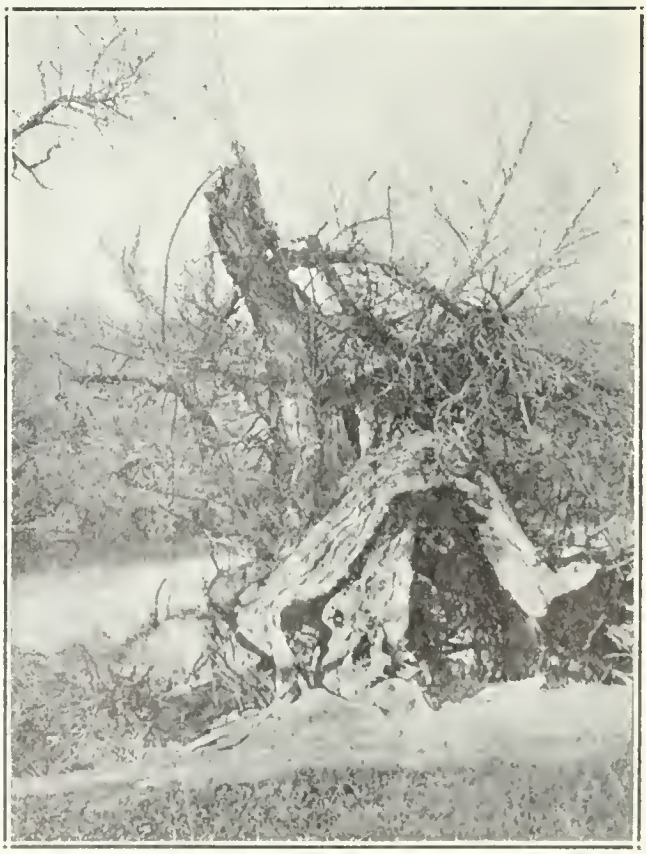


FIG. 86. A long distance shot at a hollow willow tree where cottontail rabbit made his home. February 23, 1931.

progress but after that it was in deep water and its speed became perceptibly slower while its body sank down so that I could see little more than its shoulders and head with the ears laid back. For nearly a minute it swam in this way and then on reaching shallow water at the other side, rose higher, made faster time, and at last leaped out with ears upraised once more and bounded off up the bank without stopping even to shake itself.

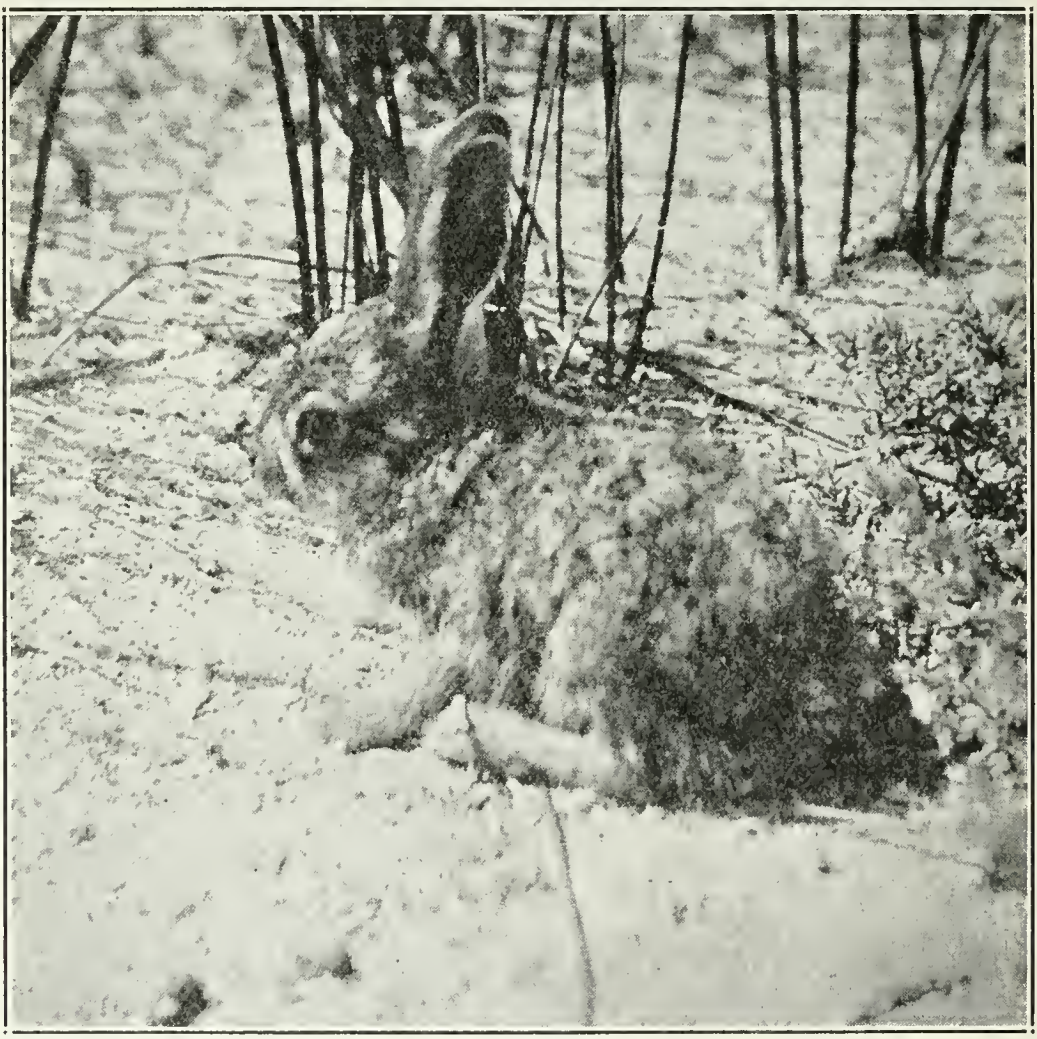


FIG. 87. Young jack rabbit at the Los Banos waterfowl refuge. February 23, 1931.

California ground squirrel (*Citellus beecheyi fisheri*). These adaptable animals go into hibernation during the winter months in the knolls and high ground where the water does not reach even at times of maximum height, but in the summer time, with the drying up of large areas of shallow flood land, they do not hesitate to spread out over the lower levels and will even dig their burrows close to standing water where the ground is dark and soggy. They have been observed once or twice to swim, too, voluntarily crossing narrow channels without apparent hesitation.

COUNTING DEER ON THE CALIFORNIA NATIONAL FOREST

By C. S. Robinson

THE ANNUAL COUNT of Columbia blacktail deer on the winter-spring feeding grounds of the California National Forest was made March 5–7, inclusive.

The area chosen as typical of the type of country where the deer may be found at this time of year was the Thomas Creek canyon. This canyon while larger, is similar in topography, aspect and composition of vegetative types to adjoining ones, so that records of numbers, observations as to feeding habits, and kind of forage eaten may be applied in percentage to any other area of like characteristics.

The Thomas Creek canyon country appears to be well suited to the requirements of these deer. It offers a good assortment of early annual grasses and weeds growing in the open parks or glades of blue and live oaks which are the main feeding grounds at this time of year. Dense brush slopes of chamiso (*Adenostoma fasciculatum*) and manzanita afford cover and protection below the timber line.

It is interesting to note that practically 90 per cent of their food is of annual grasses and weeds, no attention being paid to browse species at this time. There is ample proof, however, of close utilization of browse later on and in the fall as evidenced by the stubby fantastic shapes of scattered chamiso and manzanita bushes, and the closely trimmed appearance of the lower branches of the oaks. Poison oak (*Rhus diversiloba*) and coffee berry (*Rhamnus californica*) just coming into leaf, were rerely eaten. Sweet birch or blue brush (*Ceanothus intergerrimus*) showed very little use, though all of these species are undoubtedly cropped heavily during summer and fall.

When not disturbed the deer could be seen scattered throughout the parks quietly feeding. On seeing us they would usually watch awhile, then bunch up and trot off towards the timber or brush cover, or over the brow of the nearest ridge and out of sight. It was quite noticeable that their direction was towards well traveled runways or trails and not towards the nearest cover; also that single deer or small bunches would run considerable distance in the parks to join others in order to stay with the band.

At this time of year they could be seen feeding throughout the day; however, the most favorable time appeared to be between 6 and 10 in the morning and from 4 to 6 in the evening.

All of the deer seemed to be in excellent condition and about to shed their winter coats. Two bucks had horns, one of which looked as if in the velvet.

The number of deer counted during the three days was 825. About 60 fawns evidently born late last year were seen.

Very few tracks of either coyote or mountain lion were noticed and the poisoning campaign conducted in January-February must have been successful.

While the problem of estimating numbers of deer will ever remain at best only approximate, this method of counting while riding through a well-established feeding ground and then multiplying the numbers seen by the areas of similar character, seems to be the best means we have at present. It certainly is superior to the methods generally used—"guesstimates."

The members of the party were as follows:

Supervisor Frank Price, Assistant Supervisor W. F. Derby, Ranger William Clifford, California National Forest; R. W. Beeson, regional office; C. S. Robinson, Lassen National Forest; Roy Anderson, State Fish and Game Commission.



FIG. 88. Don Coyote, Jr., is just as innocent looking as a puppy. A coyote pup from five miles west of Helm, Fresno County. Photo by J. Dixon, 1920.

THE COYOTE AND HIS CONTROL

By E. Raymond Hall

THE COYOTE, despised by some, loved by others, has both virtues and faults. He is really a wild dog. Inasmuch as the old adage "Give a dog a bad name and he will not live it down" has a measure of truth, let us mention first a few of his virtues.

He is a health officer among game and other animals, including man himself. For one thing, he is a scavenger and on watersheds, which supply water for domestic use, he retrieves many a carcass for food that otherwise would decay and contaminate the water supply, or serve as a lure to filth-loving insects which carry the organisms of decay to man's food. The services rendered in this direction are much greater than the casual observer would suspect. One reason for this is that when the service is done the evidence is largely removed. Several times I have noted the carcass of a deer, or one of man's domestic animals, which in a few nights time was all but obliterated by coyotes. Only the larger bones remained.

More important still, as a health officer, are his services in eliminating the diseased and unfit. By taking relatively more of the weaklings than of the vigorous over vast periods of time, say among deer, the race of deer has doubtless been improved. The outstanding service, however, is in taking the diseased. By reason of the ease with which sick animals can be caught—and, probably by long experience, the flesh-eaters seem almost instantly to recognize in their prey such actions as are due to illness—they tend to be eliminated before they can act for long as carriers and spreaders of disease. A case in point illustrating the value of the flesh-eaters is furnished by the willow grouse.[1]

The grouse were subject to semiperiodic outbreaks of endemic coccidial disease. Although the grouse were present in fair numbers, each year there was appreciable fluctuation. This influenced shooting. Thinking to increase the grouse supply, well meaning sportsmen had the predatory birds and animals removed. True to prediction, the grouse increased for a time. Then the endemic disease broke out again. This time it spread so far and wide that the grouse were all but exterminated and have not recovered over a long period of years since, where before, a fair number of healthy birds were always to be found when the flesh-eaters were on guard to snap up the diseased before they could spread the lethal malady to so many of their fellows.

Coming nearer home, we have some reason to suspect that when the flesh-eaters are removed the California quail may react like the grouse. Dr. Clarence O'Roke's valuable studies of the quail[2] for the Fish and Game Commission showed the existence of a protozoan disease in that species. This disease, possibly brought by introduced species of game

[1] Nature (London), pp. 567–568, 1927.
[2] Calif. Fish and Game, vol. 14, pp. 193–198, 1928; Univ. Calif. Publ. Zool., vol. 36, pp. 1–50, 1930.

birds, or possibly endemic, takes toll of the quail and when the flesh-eaters (carnivores and birds of prey) are not on guard to snap up the sick individuals the latter linger on to provide disease organisms for the ever present blood-sucking flies to transmit to healthy birds. Also in some places where the carnivores have been eliminated, the quail decreased.[3] There is good reason, therefore, in the interest of game propagation alone to use the greatest caution in reducing the carnivores. Among the carnivores acting, at least in part, as game protectors, the coyote, of course, is only one, but he is an important one; important in ways other than the one just cited.

One of the other ways in which he operates to man's advantage is by acting as a check (not necessarily as a control) on harmful rodents. Here we should digress to avoid the common misconception that all rodents are harmful. The grasshopper mice (*Onychomys leucogaster* and *O. torridus*), for example, feed almost entirely on insects.[4] A great number of these insects are of kinds which damage forage and crops, and prevent us from regarding the grasshopper mice as harmful. However, a great many kinds of rodents, among others the California ground squirrel, are regarded as "harmful" because they take heavy toll of forage for game and stock; they destroy cultivated crops, the eggs of ground-nesting birds, like quail, and act as carriers of disease. These rodents are subject to fluctuation in number. The fluctuation is greater in the polar than in the temperate latitudes and least in the tropical zones; but some fluctuation occurs everywhere. Here in our temperate latitude these fluctuations seem generally to be determined largely by weather conditions and abundance of food and shelter. When an increase goes unchecked, due to absence of the carnivorous animals, or for any other reason, nature often takes care of it eventually by a plague [5] which sweeps away all but a few individuals. As is well known, the damage done before the plague comes to the rescue usually is large, not to mention the sums spent in attempted artificial control. Now right before this happens is when the carnivores play their most important part as checks. When any one rodent species begins to increase in numbers, the flesh-eaters, naturally, by reason of the ease with which this kind of food can be obtained, concentrate on it and the numbers they eat often account for a slowing down of the increase until climatic conditions again bring the species back to the average. In this way outbreaks are prevented. It is readily seen, therefore, that the action of the carnivores as natural checks is of deciding effect when the increase *begins,* not after an outbreak is accomplished.[6]

In checking an outbreak at its beginning, the coyote alone may have deciding effect, especially with ground squirrels and rabbits, which form his staple article of food. Furthermore, in these two species the plagues which often eventually act in the coyote's absence are of kinds transmissible to man. These are tularemia in the rabbits and the dreaded bubonic plague in the California ground squirrel. In these cases the flesh-eater, the coyote, not only forestalls an expensive out-

[3] Seton, E. T., Lives of Game Animals, vol. 1, p. 391, Doubleday Page and Co., 1925.
[4] Sperry, Chas. C., Technical Bull., No. 145, U. S. Dept. Agric., pp. 15–19, 1929.
[5] *Bacillus murisepticus* in the Kern County mouse outbreak of 1927; *B. tularense* in the Berkeley Hills mouse outbreak of 1927; *B. pestus* carried by ground squirrels in the San Francisco Bay region of California.
[6] Among the scores of cases to be cited, see, Calif. Fish and Game, vol. 9, p. 111, 1923; and Univ. Calif. Publ. Zool., vol. 30, pp. 189–203, 1928.

break of rodents or rabbits, but at the same time prevents an outbreak of disease dreaded by man himself! Suggestively enough, the two outbreaks mentioned above (footnote No. 5) in which plagues broke out, followed ill advised extermination campaigns against the carnivorous animals. In wild life administration it must be recognized, as trained biologists long have done, that there are complex relationships which make it impossible in most cases to produce, say, more game, simply by killing the animals other than man which prey upon it.

Similarily, neither is it usually possible to adjust things exactly to man's satisfaction by eliminating some entire group. Indeed, among the smaller animals, like insects and rodents, it seldom is possible, except theoretically, to exterminate the species. If it is exterminated or even reduced to very low ebb, it sometimes is replaced by a still more objectionable species; or it turns out that in other ways the attempted cure is more expensive than the illness. Thus, if the California ground squirrel were exterminated—and it will not be with our present density of population—the more objectionable brown rat might very well take its place. Some well-informed persons think this probable. Then, too, it not infrequently happens that the exterminated species acted as a check in some unsuspected direction, and a new problem develops!

Lately, investigators have expressed the belief that coyote control should not have been carried on in certain areas where deer damage to crops is increasing. The damage seems traceable largely to does. Unlike the sportsmen who take the big vigorous bucks, the coyote takes the diseased weaklings and decrepit does. With a fair number of coyotes might we not have avoided much of the present difficulty which is of growing seriousness? The case of the Kaibab deer lends support to this belief.

Quite a different way in which the coyote constitutes an asset is through providing a considerable income in fur. In California alone the annual return certainly averages around $100,000 and perhaps two or three times that. The coyote might, under wise management, constitute an important part of our valuable, but neglected, natural resource, the wild fur supply.

Now to the coyote's faults. He takes sheep and is especially troublesome at lambing time. He may make inroads on poultry. Although the figures on such losses are much exaggerated, the losses are real. The fact that it is the individual coyote, one out of a great number, which turns "killer," makes the losses no less in amount. Coyotes have been known to carry rabies, too. Again, although the damage done by rabid coyotes is greatly exaggerated and overemphasized by many, and although the coyotes do not act as reservoirs for the disease, but get it from dogs, which, if properly muzzled all over the land for a given period of time, would result in elimination of the disease, it is a fact that coyotes have transmitted rabies to domestic animals and to man himself. When this state of affairs is found, it has to be met with appropriate control measures.

Coyote control has been attempted by the following methods: (1) By use of dogs; (2) by trapping when furs are prime; (3) by offering bounties; (4) by hired government trappers working in the

fur season and out; (5) by organized drives; (6) by den hunting; and (7) by use of poison.

To take up these methods in reverse order it may be said that the use of poison, although widely practiced, is highly objectionable. It is to be hoped that the growing volume of protest against it will soon result in its discontinuance. Its use is justified only in a case of absolute necessity, such as might arise in a serious outbreak of rabies. One objection to it is that the "killer coyote," the individual sought, is no more apt to be taken than any other one. Indeed, because of his canny nature developed through experience with man, he is less apt to take the poison than others of his kind. The main objection, however, is that even when most carefully distributed, either in suet pellets or in meat baits, poison destroys a far greater number of unquestionably beneficial animals[7] than it does of coyotes. When used in a region for the first time, poison often has really denuded that area of the smaller beneficial animals. Although its subsequent use there against the wary coyote, some of which persist in spite of the use of poison, does not destroy so many smaller, beneficial animals, this is due to the latters having been so thoroughly killed off when poison first was used. Also, the wiser, adult coyotes refuse the poison baits, which are apt to be buried by mice, carried afar and dropped by birds, or otherwise distributed so that they may be picked up later by any animal less wary than the coyote. Many times, too, valuable dogs are killed by the poison. The animals killed by poison have no fur value unless found soon after death. A large majority so killed are never found. The use of poison is the most objectionable[8] of all the methods of control.

Den hunting, practiced in the spring and summer, enables the coyote hunter to run up an imposing list of animals destroyed. Almost all the animals accounted for are young which have done no damage and in the vast majority of cases never would. The larger number would furnish valuable pelts to private trappers the following autumn or winter before they were old enough to develop renegades. This method, then, is wasteful as regards the fur and, like poison, seldom gets the individual causing the damage.

The next method of control, much practiced in the Middle West is the "Wolf Drive." It is employed under the guise of a protective measure, but actually is carried out more for the sport it furnishes. Having in times past, as a rather irresponsible sportsman, participated in many of these, may I proceed to a true account of a "wolf drive's" initiation and operation. The conversation of those grouped about the friendly warmth of the stove in the general store having reached an *impasse* on national politics and exhausted the weather possibilities, present, past, and future, someone suggests a wolf (coyote) drive. Then and there an area is chosen; a Saturday is set; and eight captains are selected. On the morning of the appointed day a few men with shotguns have posted themselves along the roads on the four sides of the twelve mile square. At 9 o'clock sharp those at the corners start toward the center of the square and by 9.20 those at the middle of each side are marching too. Now we have a circle, twelve miles in diameter,

[7] Jour. Mammalogy, vol. 11, pp. 362–375, 1930.

[8] Hearing before the House Commitee on Agriculture * * * on H. R. 9599, Serial O, p. 59. 1930.

of widely spaced men converging on a central point. As one farm house after another is passed the male occupants, from five years of age up, fall into the line while the mounted captains by much furious riding along the roads, try to keep the line of hunters in circular form. The constant additions to the ranks together with the resultant crowding of the men as the circle grows smaller, form a progressively more solid line which at the finish may be several men deep.

Here is the thrill we have walked six miles or more to get. Luck being with us, one or two coyotes are in the ring, and they act for all



FIG. 89. Don Coyote, Sr., looking wistful. Close up view of male mountain coyote captured at foot of Yosemite Falls trail, Yosemite Valley, December 31, 1914. Photo by C. A. Hollinger.

the world like my dog Jake did the time he followed the buggy to town and got lost on Center street. Shotguns boom; boys yell; Jim Smith's tightly stretched trousers' seat, as he stoops to retrieve a dropped shell, proves poor armor for misdirected No. fours from the other side of the ring; Sam Smith gets a stray shot in the knee; but the "wolves" are killed, or else get away, to be chased out of sight by Joe Green's greyhounds trained for jackrabbits. Anyhow, a good time is had by all and the ladies' aid, at the nearby schoolhouse, serves dinner. Dinner

over, we boys, in plain sight of the city sports, waste innumerable shells on empty tin cans tossed in the air for targets until one of the sophisticated urban sportsmen derisively casts doubts that we could hit the side of a house. With a proper rural hesitancy and injured air we offer wagers on our ability to hit his hat tossed in the air. The wager accepted, a surprising reversal of form results in the destruction of the hat, and another carefully laid plan of the rustic farm boy has demonstrated the gullibility of his object of contempt.

But hark! The stentorian voiced county auctioneer has mounted the schoolhouse steps and is offering the "wolves" to the highest bidder. The proceeds, plus that from the dinner, are placed in the hands of the treasurer of the ladies' aid, to apply on the pastor's overdue salary. And so the drive is over. Homeward we go, the more fortunate in grain wagons (now replaced by cars) the women folks drove over, but many trudging across the snow covered fields, little realizing that the none too scrupulous class of gunners who participated have tested their marksmanship on else than coyotes and, in fact, have played havoc with the quail and other small game of the area.

The method of employing paid government hunters to trap the year through is objectionable in that more small fur bearers than coyotes get in the traps; not to mention valuable dogs. The fur taken out of season is wasted. The rodents may increase due to removal of their principal natural enemies. Since the work is paid for out of the tax money, the farmer argues, with some justice, that if the sheepman is to have this "free work," certainly he, too, as a taxpayer, should have some "free work," say a government cutworm catcher in his cornfield. It is pointed out, too, that it costs around $25 for each coyote taken, which is outrageously expensive. All those who trap for fur in winter are more than annoyed at this waste of a valuable natural resource. The wise, experienced "killer" coyote is not always first to get in the trap and very often watches his less canny relatives and other species of harmless and beneficial animals precede himself in taking the fatal misstep. For these and a host of other reasons, the system of employing government trappers to work the year around is neither economical nor efficient.

Less expensive, slightly less objectionable but no more effective, is the bounty system. This seems really to work only with a large mammal, like, say, the mountain lion, where it pays to go after the individual. When the species is reduced to the point where it no longer pays to go after the individual, no control is accomplished and the net result is to redistribute some of the tax money. Once established, such a system is difficult to discontinue and too often the bounty system is extended to cover "new" kinds of "pests." Then, as has happened in many counties, the treasury is depleted; the county goes in debt to carry through the year and the bounty has to be discontinued or the tax rate raised enough to take care of the burden. There is the matter of fraud, too. Foxes, dog skins and what-not are "made into coyotes"; innumerable substitutes are palmed off as the original. Without a uniform bounty on coyotes those from all adjoining districts tend to be presented in the one paying the highest bounty. More often than not, bounties, established by well meaning citizens, are paid in areas where the animal in question is more beneficial than harmful.

Nevertheless, we probably shall continue to have bounties so long as sheepmen, farmers, and hunters act as biologists; just as we shall continue to have untimely deaths so long as people insist on plying their ills with the wares of the patent medicine man, rather than seeking the advice of a physican.

Private trapping for fur as a general control undoubtedly is better than any of the methods already mentioned. Furthermore, where the others have not been employed, it has given just as good results. Of course this was not always true, but has been over the past few years on account of the high prices of fur which, in effect, place a high bounty on the animal. The animal is *used*. Taxpayers' money is not spent in getting him. Instead, a productive means of livelihood is afforded to many.

This alone, however, is sometimes not enough. The "killer coyote" has the knack of keeping out of the sets of private and government trappers alike. Here is where the dogs come into their own, especially in the open country—hounds that run by sight. Before the advent of the poisoners, which spelled the doom of certain types of good dogs as well as that of foolish coyotes, this method was much practiced in the west. No better sport is to be had either. Away after the quarry, and some *can run*. Although the average coyote can do only about twenty-six miles per hour, some are much faster and give the wolf hounds a good run and now and then a tolerable fight. Here the wise old killer coyote has but little better chance than any other. Indeed, by using one good trailing dog to start the wolf hounds—and a pair of wolf hounds do the work—the killer can be singled out at the scene of one of his misdeeds, followed, jumped, and quickly dispatched. With good dogs, one man can, and has, equalled the achievement of the full time control man using poison and traps. Also this method is economical of the harmless and beneficial kinds of animals. In the more thickly timbered sections, like the redwood belt where the coyote has followed man, hounds that hunt by sight are, of course, not so successful, but over the majority of the range of the coyote they are far and away the best method of "control" and get the renegade individual.

In review: The coyote, by reason of its high rate of reproduction, adaptability and cunning, will persist in spite of efforts to exterminate it. A few will persist after other valuable species are exterminated by efforts directed at the coyote. Therefore, any method of control used should not be destructive of valuable fur bearers, game, and other beneficial wild life. The coyote has virtues which make it worth encouraging in certain areas. Outstanding of these are its services as a disease eliminator among game, as a preventive of bubonic and other plagues dreaded by man, as a check on harmful rodents, as an eliminator of decrepit game which may damage crops, and as a valuable fur bearer. The coyote has faults of which the following are noteworthy: It contracts and sometimes spreads rabies. Renegade individuals destroy sheep and sometimes poultry. Where this occurs control must be resorted to. Any effective method of control must permit singling out the individual which does the damage. The poorest methods of control are, first, poisoning, and second, trapping out of season. The best methods of control are winter trapping, supplemented,

where necessary, by the year round use of hounds against individual culprits.—*Museum of Vertebrate Zoology, University of California, December 19, 1930.*

GOVERNOR ROLPH—CONSERVATIONIST AND SPORTSMAN

[The following data and ancedote on the Governor was divulged by his son, James Rolph, III.]

GOVERNOR JAMES ROLPH, Jr., is a conservationist and sportsman of the first order. A large landowner and rancher in the State, he has spent years in study and development of fish and game resources. It is the first time in many years that California has had a Governor who is so keenly interested in this phase of the work.

On his ranch in San Mateo County, he maintains an excellent kennel of trained dogs. Much experimental work on various breeds has been done here and some astonishing results are noted.



FIG. 90. Governor James Rolph, Jr., starting on the trail of the wary buck. Photograph submitted by James Rolph, III, May 1, 1931.

In his quest for superior hunting stock, he has even imported the wild dog from Australia. This breed was crossed with the American shepherd dog and an excellent jumping dog for brushy country was the result.

The Governor spends as much time as possible riding over his property and making personal investigation of the game life. Game nuisances are abated to a reasonable degree. One day during the deer

hunting season he deliberately allowed a fine buck to escape while he shot a coyote that was causing serious damage.

One of his greatest delights of the year is to get into camp with a party of sportsmen and to pursue the wary buck, without benefit of the rifle. The Governor will ride for hours with his pack of dogs and rout the animals from hidden retreats.

He dosn't seem to care much about bagging the game himself, but he will go along with some enthusiastic hunter and, if necessary, scout around and see that his friend gets a couple of chances at a real, moving target. If you are the friend and are unlucky enough to miss your



FIG. 91. California's Governor, James Rolph, Jr., attired for the hunt. Photograph submitted by James Rolph, III, May 1, 1931.

target, you can rest assured that your evening in camp is going to be a "warm" one.

Several seasons ago George H. Latham was a guest in the Rolph camp. Around the fire in the evening he expressed the desire to be the first of the party to bag a fine buck. Governor Rolph readily agreed to help him.

Although Latham is an enthusiastic sleeper, Governor Rolph had him up and on the trail long before daylight. The hunter, despite his profound drowse, was stationed at a point of vantage.

Governor Rolph disappeared into the brush and soon located a trim four-pointer near a clearing. Circling the intended buck, he succeeded in driving the animal directly to the point where Latham was stationed.

There was a hushed silence. Governor Rolph strained his ears but he could detect no sound of rifle fire. Returning disgustedly to the station, he was surprised to find that the hunter had disappeared.

Then his ear detected a series of long sonorous grunts. Under a nearby tree, he found Latham stretched out, peacefully snoring. The awakening was not a gentle one and the Governor thereafter designated this hunter by the name of "Buck"—the nickname seems to be a permanent fixture.

Those who have been in a Rolph camp declare that the Governor keeps the place in a constant "uproar." There is no room for the grouchy camper. With all the fun, he is a strict observer of laws and demands that his guests exercise good common sense when dealing with the wild living things.

CALIFORNIA FISH AND GAME

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In America people of all classes own land—therefore everyone will always be able to shoot.

IMPORTED FISH AND GAME

Our native fish and game must be protected aganist undesirable species from other states and countries. Carp were enthusiastically introduced into California in the belief that great benefits to the State would follow. The destruction of good fishing and the nuisance they have created are familiar to all, yet these fish are still being carelessly added to new waters in the State.

California laws are strict and definite. No fish, fish eggs, or aquatic plants or seeds may be legally brought into the State for the purpose of propagation without proper notice to the Commission, followed by an inspection of the proposed introduction. The Commission may destroy diseased shipments, and cause reshipment or destruction of deleterious fish, eggs, aquatic plants or seeds. (Stats. 1919, Ch. 38.)

All employees of the division are cautioned to watch closely for any attempted introduction, and to take prompt action to safeguard the State. *Our native fish and game must be protected!*

FOREST FIRES DESTRUCTIVE TO WILD LIFE

The majority of the telephone calls which reported a recent forest fire came from tourists who had seen the smoke and taken the trouble to hasten to the nearest telephone. It is only a few years ago that these same people would have given no attention to the smoke, merely remarking, "just another forest fire." Now they lose no time in getting to the nearest telephone, and the phone people gladly do the rest —such calls being given right-of-way and there being no toll charge.

Figures show that 134,895 forest fires were reported in the United States in 1929, burning 4,876,320 acres of protected areas and 41,353,000 acres of unprotected areas.

The average person has no idea how valuable his services may be in eliminating forest fires, which take such a tremendous toll of wild life as well as property. Careless smokers alone accounted for many of the fires last year.

Cutting down the loss of wild life by fire is an important part of any game protective program.

Everyone can do two things—first, help cut down the cause of forest fires, and second, report every fire to the proper authorities. The telephone officials will cooperate everywhere.

Break your match before throwing it away. The 40,000,000 or so tourists, fishermen, hikers, canoeists, hunters and campers can prevent many forest, grass and brush fires by using a reasonable amount of common sense. Pour water on your camp fire and be certain that it is out before leaving camp.

OUR GAME IS AN ASSET

When seasons for game fish, game birds and deer open, everybody grabs a gun or rod and thinks of nothing else until they have the limit.

Those who live in Modoc County are too prone to ignore the fact that the sports offered are one of our main assets.

In considering hunting and fishing we are apt to think only as it affects our own pleasure, losing sight of the fact that every year it brings thousands of dollars into Modoc County through hunters from different sections of the State and country.

But it is an item to be reckoned with as each hunter from outside spends money here.

During the present year there were checked into the Modoc National Forests a total of 4000. However, it unquestionably is a much larger figure since the government has discontinued the practice of listing the names of all those who enter the forests.

It is conservatively estimated that at least 2000 more entered for hunting and fishing and did not list their names. Those who filed did so voluntarily.

On the estimate that 6000 hunted and fished in the county this year, that would bring in to merchants of Modoc county at the lowest estimate, $60,000.

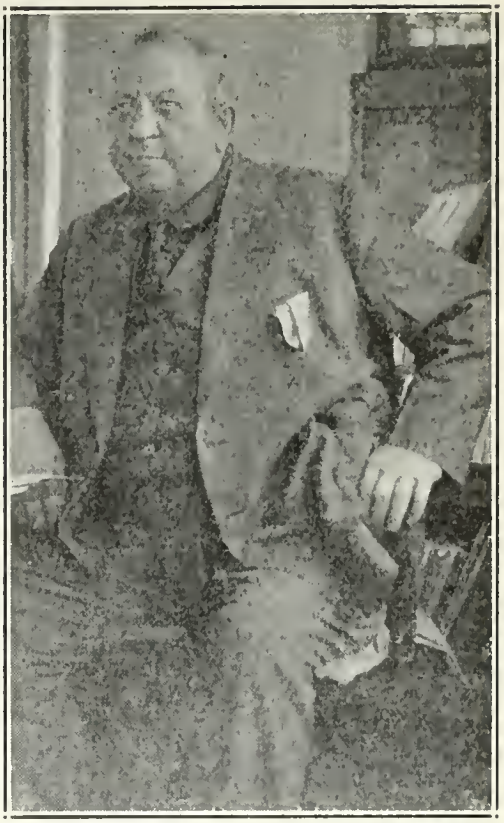
And it is improbable that hunters on vacations would spend the meager sum of $10 here on such a trip. Practically all their food would be purchased in the district and possibly all their shells and some fishing tackle and incidentals.

One consideration in connection with this when thinking of the merchants is that this is all cash trade. The money comes from the outside and stays here.

For the above reasons it is advisable that Modoc County's game laws be observed and this great asset protected, for should the game be depleted through ruthless slaughter in violation of the State laws, it would mean the end of this outside income that looms large in the business of Modoc County merchants.—*Alturas Times*, January 15, 1931.

In Memoriam

HARRY IRWIN PRITCHARD



With the death of Deputy Harry Irwin Pritchard on April 3, this year, the Division has lost one of its oldest and ablest workers. He was born on November 28, 1867, at Charleston, Illinois.

According to records he was appointed to duty in the fall of 1900. During his tour of duty he witnessed many changes in fish and game conditions here in the Far West because of the tremendous increase in the population. He was always a strong supporter of conservation measures and his record will vouch for the excellent service that he has performed.

He was married and was the father of two daughters.

SELLING NATURE SHORT

As long as there are restrictions against the sale of game birds or animals, there will be people who will be willing to pay for the privilege of having that game. Just so long as there is an available market there will be hunters engaged in supplying it. Too many times the families of the sportsmen who condemn the bootlegging of game the most are the ones who are responsible for the illegal practice.

Hunters who obey the game laws at all times, who never break limit regulations and only shoot during the open season, allow their wives to purchase quail and ducks out of season or in season and smile when it is suggested that perhaps the practice is not ethical. A united front by the sportsmen and a demand that the nonsale laws be enforced would go a long way toward stopping the practice.—*San Francisco Chronicle.*

WILD-LIFE REFUGES AT TRAINING CAMPS

By request of Major General George Van Horn Moseley, deputy chief of staff of the War Department, at a conference in Washington, the National Committee on Wild-life Legislation has appointed a subcommittee to formulate a plan for converting the wartime government training camps of the nation into wild-life refuges and game producing areas.

This subcommittee will submit its plan to the War Department for consideration. It is composed of Seth Gordon, president of the American Game Association, chairman; Dr. John C. Phillips, president of the National Wild Fowlers, and E. Lee LeCompte, representing the International Association of Game, Fish and Conservation Commissioners.

The national committee, representing all national wild-life organizations and State conservation officials, as well as the United States Biological Survey, offered the services of conservation groups in carrying on the proposed program.

Steps toward cooperation by the war department in preserving wild life resources are the outgrowth of a recent move inaugurated by Major General Dennis Nolan, commander of Camp Knox, near Louisville, Kentucky, who created a game sanctuary of 13,000 acres on the Knox reservation.

The program of establishing refuges at the army camps, of which large areas lie idle in peace time, would call for game restocking, the restoring of natural food and cover, and for general protection.

Of the 600 pieces of land in the country controlled by the War Department, 40 or 50 are large enough to offer possibilities as sanctuaries for game and other wild life, according to Major General Moseley.

Other organizations represented on the committee are the American Forestry Association, the National Association of Audubon Societies, the Izaak Walton League of America, and the Western Association of Game Commissioners.

RAILROADS TURN TO CONSERVATION

Railroads, which long ago became deadly enemies of wild life by paving the way for the onward march of civilization, are now beginning to rival state-owned game preserves as wild-life refuges.

Eight railroad companies operating in Missouri have converted their rights-of-way into homes for wild birds and animals. This move has created a network of sanctuary grounds traversing the entire State and almost totaling in area the 70,000 acres in Missouri's leased refuges and official parks.

Railroads of Virginia recently offered to cooperate in the same manner with the department of conservation. Other State departments are seeking to inaugurate a similar system for wild-life preservation, and the Canadian National Railways, extending across Canada, is said to be considering the plan.

The railroads cooperating in the movement have agreed to leave natural food and cover standing along their rights-of-way, to plant other food, and wherever possible to aid in winter feeding.

"Such refuges," the game official said, "will be of especial help in restoring the thinning ranks of game birds."

INCREASING WILD-LIFE PROBLEMS

Here are some interesting figures that were compiled by the United State Forest Service. Although no mention is made of the wild life, a person can readily visualize the constantly growing problems that conservation faces in perpetuating the living things in the face of the army of invaders:

Recreation records of the 18 national forests of the California Region for the past year shows that business conditions in 1930 affected the more expensive forms of vacations, such as sojourns at summer resorts and hotels, but had little effect on the simpler and inexpensive kinds such as hiking and picnicking. The number of guests at summer

resorts and hotels operated under permit from the U. S. Forest Service in the national forests declined from 1,018,000 persons to 573,000, but the number of hikers increased from 101,000 in 1929 to 112,000 in 1930, picnickers increased from 1,174,000 to 1,336,000, and campers from 659,000 to 734,000. The number of permits for summer homes increased from 5,876 to 6,092, a gain of 216, proving that the business depression did not reach the mountain cabins in the national forests. The total number of persons, including transient travelers, visiting the national forests of the State, declined from 18,000,000 in 1929 to 16,000,000 in 1930, according to estimates by the forest rangers.

BETTER YEARS FORECAST

Sportsmen throughout the United States have fired a jubilant farewell volley of double-barrelled shotguns over the grave of 1930, on which they have bestowed the following epitaph:

"The year which saw more hunting and less shooting than any year in a generation."

That sentence summarized the results of a nation-wide survey of hunting conditions, conducted by *The Sportsmen's Review.*

"Hunters are unanimous," The Review said, "in reporting the poorest season they can recall, both for quail and duck."

Sportsmen generally attributed the scarcity of ducks in the interior states to lack of water, which caused the ducks to make non-stop flights for their winter havens. The lack of quail, however, was not so easily explained as the dry summer supposedly offered ideal weather for the young broods.

The gloomy year just ended brought one bright ray of hope, however, and it seems likely that 1930 may go down in sportsmen's history as the year which saw the setting of the stage for the restoration of abundant game in every part of the country.

This hope, the officials explained, is based on the adoption of a new American Game Policy at the American Game Conference in New York on December 2. This conference of spokesmen for the country's 25,000,000 hunters and fishermen went on record, in adopting the new policy, as being ready to "take the farmer into partnership" in conserving and developing America's game supply.

The policy declared the sportsmen's belief that farmers and landowners who foster the development of a game supply on their lands as a "secondary crop" are entitled to compensation from the sportsmen, and it is expected that landowners in large numbers will take advantage of this new form of "farm relief."

BILLION DOLLAR INDUSTRY

"Wild life conservation is worth $1,000,000,000 a year to this country," according to W. L. McAtee, of the Bureau of Biological Survey, Department of Agriculture.

Mr. McAtee, who is in charge of the bureau's division of food habits research, made this estimate on the basis of the following items:

Meat and fur production, about $150,000,000; destruction of harmful insects by birds, $350,000,000; production of fish, $15,000,000; hunters' expenditures, $160,000,000; hunters' license fees, more than $9,000,000; and a share of the general tourist expenditures credited to the drawing power of wild life $252,000,000.

"At least $1,000,000 was spent by visitors to the national forest and national parks in one typical year," McAtee said, "and probably one-seventh of all such expenditures may be attributed to the drawing power of the wild life in those areas. All this contributes to the material welfare of the people in sections where the parks and forests are located.

"Hunters produce a large revenue in Maine and other states," he said. "If all the areas logically available for wild life could be kept producing game, it would easily mean an increase of what may be calculated at about $21,000,000 annually."

Wild life should be given not only living room but the best available care, he declared. He urged that the layman assist in protecting wild life by winter feeding and in supplying home sites wherever possible.

GAME FISHES

STEELHEAD RUNS LIGHT

Due to a shortage of water, steelhead runs in the California streams have been very light this year.

Streams on which egg-collecting stations are located have not contained sufficient water to attract the fish. This has resulted in a very much smaller egg-take, to date, than is usually received at this time of year.

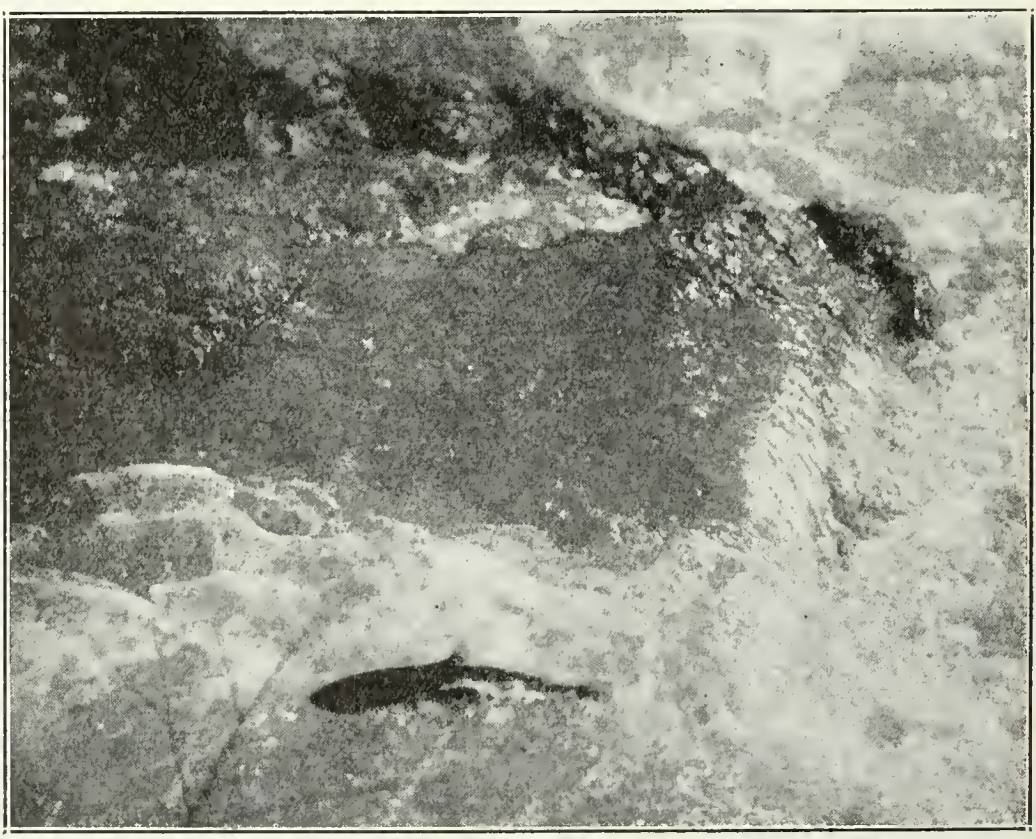


FIG. 92. A fine steelhead going up a fish ladder at Snow Mountain on the Eel River. Photograph by E. S. Cheney, February, 1930.

The extreme drought is quite noticeable in all main streams and tributaries. Unless there is sufficient rainfall to thoroughly soak the ground and create a run-off, the fishing activities will be greatly curtailed.

Egg-collecting stations along the coast streams and tributaries opened about the first of February and will continue to operate as long as there is practical need for such work.

FISH NEED SHADE

By planting willow twigs and shrubs along river banks that will soon grow and furnish shade during hot weather, sportsmen can create a better environment for trout, bass and other game fish.

Nature lovers can do just as much to improve the environment of the fish family as they are doing for quail, grouse, pheasant, turkey, rabbit and deer. Trout and bass shun water temperatures that are either too hot or too cold. A good cover growth along the banks of ponds, lakes and streams attract many insects, thus increasing the food supply for fish.

Trout seem to thrive best where the daily maximum temperature does not exceed 68 degrees and the temperature variation throughout the day is not too great.

Many people once believed that trout thrived best where the water was coldest. Many fish culturists believe that an extreme water temperature has kept many plantings of young trout from maturing. Trout shun water that is either too warm or too cold.

One way to control temperature is to plant a fringe of brush or small trees along the banks of small streams which are barren of cover.

NEW FISH-TAG METHOD

Wild ducks, geese and other migratory game have long been tagged by investigators to discover the extent of their wanderings. But in the past experiments with tagging fish have proved more or less unsuccessful, as the weight of the tags hampered the fish and usually caused injury.

A new miniature tag, however, has been designed by Dr. Carl L. Hubbs, director of the Institute for Fisheries Research of the Michigan Department of Conservation.

The new tag will be of such construction that it will not injure fish as small as three inches long. It can be worn on the edge of the gill, like a dainty pendant, or on the upper fin with piscatorial chic.

By so adorning fish raised at hatcheries experts will first seek to determine what migratory habits trout acquire and how soon, as well as how many survive after they are distributed.

SCIENCE MAY DISCOVER FISH DIET

Mustangs rounded up on the open prairie are killed in large numbers and packed at a Butte packing house for shipment to Europe. But the livers, rich in vitamins, have remained in Montana to supply vim and vigor to baby trout at the state's 14 hatcheries.

The "fingerling" game fish raised yearly at these hatcheries have thrived on a mixture of liver and cereal, but now the wild horse is dis-

appearing, and human beings, also in search of vitamins at the doctor's orders, have made the price of beef liver prohibitive.

So the state Fish and Game department, following modern scientific methods of conserving wild life of all kinds, is trying to find a way to feed the wild mountain trout after the supply of liver is exhausted.

Experiments have been conducted with dozens of different kinds of vitamin-bearing foods, ranging all the way from dried carp to Mexican pinto beans and there is still a chance for some young scientist to make a name for himself by discovering a diet as good as the liver-and-cereal mixture.

BLACK BASS HABITS

Black bass eggs are adhesive and therefore can not be stripped from the fish, as can those of salmon, trout or pike. The eggs become glued to the pebbles or stocks at the bottom of the nest when deposited by the female fish. After the milt is spilled over the eggs by the male bass they are guarded faithfully by the fish until hatched. Intruders of all kinds are fought off by the wily male bass and the eggs protected day and night. At this period the fish does not take any food, but will strike viciously at a stick, frog or anything cast near the nest in the belief that it is some form of enemy after the eggs. I have heard of bass attacking muskrats in their effort to save the newly deposited eggs, and can well believe it, after experimenting with large sticks and rubber balls to attract the male bass off its bed.

Regardless of whether or not the season is open, black bass should not be molested when on the spawning bed. Anyone can easily capture the proud male bass when guarding the nest, as he will dash madly after any color or shape plug cast near him. Sometimes he may make a wild dash toward the plug in an effort to frighten the intruder away, but the second time he sees the plug his mighty jaws usually are closed over it with the intention of killing the annoyer. I have witnessed the bass grasp a hookless wooden plug when cast over its nest and swim a short distance with it, then open its jaws and let it go. Evidently the fish was satisfied in merely carrying away the intruder from the nest. Anyone that has watched a gallant bass protect the nest and witnessed the true fighting heart of the bass in fighting off intruders could never molest one when guarding its young.

Some claim the female stays on the nest until the eggs are hatched and that the male bass leaves immediately after the process of spawning is finished. The general belief of fish culturists, however, is that the male bass is the one that stands guard, and from personal observations my belief is that this is correct. It is not impossible that the female takes a turn with the male bass in guarding the nest.

Black bass eggs hatch in from one to two weeks, depending largely upon the temperature of the water. The baby fish are almost perfectly formed and little less than one-half inch in length. The small fry usually stay over the bed for about five days, when they leave for deeper waters, hiding under submerged logs and among water plant. Any hostile fish that appears upon the scene after the fry is hatched with the intention of securing a meal of tender baby bass soon forgets his mission, as the adult bass is still on guard and in a more pugnacious mood than when merely guarding the eggs. The belief

that carp, suckers or redhorse can successfully molest and destroy a bass bed is not correct, as the adult can easily battle off several young fish without any great trouble. The one thing possible is this: A school of rough fish can divide in numbers and while the bass is fighting off other members of the school the remaining fish might manage to destroy some of the eggs, but not all. The nature of the egg itself helps to save it from destruction in many instances. Being adhesive, the eggs are not easily scattered around.—*Outdoor America,* March, 1931.

TRUCKEE-TAHOE

Here is a report that was received from Captain J. H. Sanders from the Truckee-Tahoe district:

We had perfect spring weather and snow is melting very fast and all streams are rising. The Truckee river has been very muddy from Truckee eastward for the past three days. There is a slight indication of some movement of fish about the creeks on Lake Tahoe.

The roads are in good condition. On the north side of the bay (Emerald) there are high centers in the snow, causing automobiles to lose traction. However, there is much activity in the movements of automobiles and people on foot in every direction, enjoying the first days of spring.

The water and the mild winter is the topic of the day!

SNAGGED STREAMS AND FISHING

Streams can be made more attractive to game fish by building snags out of logs, brush and rocks. By changing or slowing up the current, water pockets are formed and it is easier for fish foods to collect or become attached to the obstructions and areas of shade and rest are established, according to the American Game Protective Association.

Restocking experiments carried on in Michigan waters by the late Dr. Jan Metzelaar and his successor, Dr. Carl Hubbs, state fish research specialist, have proved the value of the so-called resnagging system of restoring fish to small flowing bodies of water.

When nature is left to follow her own method of taking away and rebuilding the earth's surface, obstructions are formed. These natural barriers have been removed in many streams throughout the country as a result of driving logs, a desire on the part of land owners to change water courses for landscaping purposes or to make possible the navigation of small craft.

Dr. Metzelaar's survey shows that fishermen using streams where resnagging experiments have taken place generally approve the work.

To snag a stream does not mean to dam it up altogether, but to slow up the water course at convenient points. People owning stream or river frontage can build satisfactory obstructions with material at hand.

KEEP REFUSE AWAY FROM WATER

An investigation of many sources of pollution which make many of the finest fresh water streams and lake unfit for game fish or human beings show that a great deal of contamination results from the careless

fashion in which many tourists and vacationists dispose of refuse, according to the American Game Protective Association.

It seems to be a common practise to use certain forms of rubbish in filling in low places along lakes and streams that are detrimental to fish life and persons who go in bathing. Dried leaves, grass, garbage of all forms, ashes, sawdust, coal, cinders, log slabs, decayed wood, etc., all decompose at a rapid rate when mixed with water.

It is a good rule not to dump garbage nearer than ten rods from any body of fresh water. Whenever possible, pure dirt, sand or gravel should be used in filling in low places in lakes or streams.

BIG HOOKS CATCH BIG FISH

If anglers would make a practice of using large-sized fish hooks thousands of small fish would be saved. It is illegal to take undersized fish. Besides, the majority of fishermen do not want small fish. They are put back into the water after they are taken from the hook. Many of them die from injuries.

Those fishing with worms, meat, or live bait should use a large-size hook so the smaller fish can not swallow or impale themselves upon it. It is the small hook that does the damage. Fly fishermen who use small hooks are not usually troubled with small fish, for they seldom strike.

Millions of small fish may be saved this summer to grow into large fish if anglers will follow one simple rule—wet the hands thoroughly when taking little fish off the hook preparatory to releasing them back to the waters. Of course the small fish should be handled gently and released under water, not thrown back. A dry hand disturbs the protective film of the fish. If this is broken, fungi attaches to the body of the fish and eventually kills it. Thousands of anglers that have been wetting their hands declare that millions of small fish have already been saved by this practice.

BARBLESS HOOK ADVOCATED

While violations for catching undersized fish are reported increasing as the season advances, more and more real sportsmen are resorting to the barbless hook, playing their fish and releasing them after a good fight without ever taking them from the water, according to the American Game Protective Association.

The "minnow catchers" have been so busy this season that R. G. Parvin, game and fish commissioner of Colorado, among others, has issued an appeal for better sportsmanship.

"Trout under seven inches are not fit for human consumption," Mr. Parvin said, "and when one is caught it should be carefully removed from the hook with wet hands and returned gently to the stream. If handled with dry hands, the protective film of the fish will be removed and a fungus will gather, which eventually kills the fish.

"The real sportsmen of the State are doing all possible to stop the catching of 'short fish'," Mr. Parvin continued, "for they know that these little fish will be large enough to afford better sport if left in the stream another year or two."

WHEN NOT TO TAKE FISH

"It has been found by scientific researeh that it is impossible to fish-out a lake stocked with any member of the bass family, for instance, if two simple rules are followed," advises the Izaak Walton League, "and these are, don't take any fish until they have reached a size which assures that they have spawned at least once, and don't take any fish until the spawning period is well over."

The league points out that the legal size limits and the open seasons established in most states are based on these facts. The minimum size is set in order to make sure that the fish has spawned before being caught and the season limitations set to avoid the spawning periods.

"It is an astonishing fact that, no matter how many anglers may fish in any lake or stream, it is impossible to deplete the supply if these simple rules are carefully followed," the league states, "and, in keeping undersized fish and fishing out of season, fishermen have been and are ruining their own sport, for no amount of restocking can keep fishing up to par if these simple rules of nature are ignored.

"In removing hooks from undersized trout before throwing them back, handle the fish with extreme care, drop them off the hook if possible and avoid handling with the hands as the human hand seems to cause a fungus to grow resulting in fish dying.

"Obey the laws which are intended to improve your sport, don't take any more fish than you need, take an active interest in restocking where now made necessary, and fishing will continue and improve."

BATHE FISH IN MAINE

Baths for little fishes have come into vogue in state fish hatcheries, as the result of a discovery by the Maine Department of Inland Fisheries and Game.

For years the worst cause of loss at the hatcheries, where many millions of fish are raised annually to restock state waters, has been a fungus growth which killed the young fish.

Through its experiments the Maine department has found that this growth can be destroyed if the fish are given acetic acid baths, according to Commissioner George J. Stobie.

So now each hatchery's troublesome family of millions of fish youngsters have to wash their "necks and ears" regularly, with acetic acid for soap.

Subjecting fish to various "medicinal" baths has long been a practice in the hatcheries of the State of California. It has proved to be an excellent preventative as well as a remedy in the problems of diseased fish.

COMMERCIAL FISHERY NOTES

THE 1930 SHRIMP CATCH

From 1911 to 1915 shrimp fishing with the Chinese shrimp net in San Francisco Bay was legally forbidden. As shrimps are taken in California waters only in San Francisco Bay this meant that the only shrimps found on the market were imported. In 1914 two companies in the northern part of the bay (Dist. 12) started fishing with a small beam trawl. This method proved successful and is still in use today. In 1915 the southern end of San Francisco Bay (Dist. 13) was opened to the Chinese shrimp nets. Four companies started fishing with the Chinese gear. Camps have been added irregularly until in 1929 and 1930 there were twelve camps. The total catches of shrimps has steadily increased from 298,000 pounds in 1915 to 4,500,000 pounds in 1929. This is as it should be. When a fishery is in a healthy condition the total catch should be proportional to the effort expended in procuring it. Thus as the number of camps increased the amount of fishing effort would also increase and the catch would mount accordingly. The 1930 shrimp catch, however, dropped to 2,687,115 pounds. This does not show depletion. The drop is too sudden. Why this condition has developed is not known. The next few years may give us the key to it.—Paul Bonnot, February 25, 1931.

TUNA FISHING AT CAPE SAN LUCAS AND GUADALUPE ISLAND

About the first of February, 1931, after the voluntary cessation of fishing operations on the part of the fishermen and canners during December and January, the fleet of tuna purse seiners left for Cape San Lucas in pursuit of the yellowfin tuna. However, after spending forty days in this region the fishermen returned to San Pedro, only a few boats delivering yellowfin, the total poundage of which amounted to less than fifty tons. The fishermen attribute their lack of success to scarcity of fish as well as poor weather. In past years of good fishing, catches were made at Cape San Lucas from February through April.

When the new bluefin tuna area was discovered at Guadalupe Island (Mexico) in June, 1930, predictions were made that bluefin would be caught in this locality early in 1931. Over a hundred tons of this species have already been delivered from this region to San Pedro between March 24 to 31, 1931.—S. S. Whitehead, California State Fisheries Laboratory, March 31, 1931.

FISH CATCH FIGURES

Complete figures of the commercial fish catch along the California coast for 1930 have been compiled, and show that 598,139,238 pounds of fish and shellfish were landed by California fishermen. In addition to this, 88,947,784 pounds of fish and shellfish were taken from south of the international boundary between California and Lower California and landed in San Pedro and San Diego. The major portion of the

California catch was 494,450,747 pounds of sardines, most of which was delivered to canneries in Los Angeles Harbor, Monterey and Pittsburg. The salmon catch amounted to 6,002,894 pounds; striped bass taken commercially was 866,808 pounds. As each district is more or less interested in the amount of commercial fish landed, we are giving the total landings in the various county groups:

Del Norte-Humboldt	5,841,663
Mendocino-Sonoma-Lake	1,655,766
Marin	2,070,437
Solano-Yolo	486,030
Sacramento-San Joaquin	918,744
Alameda-Contra Costa	2,315,338
San Francisco-San Mateo	65,727,091
Santa Cruz	2,854,803
Monterey	277,289,074
San Luis Obispo-Santa Barbara-Ventura	8,996,380
Los Angeles	215,233,002
Orange	2,159,749
San Diego-Imperial	12,591,161
San Pedro from south of international boundary	29,633,440
San Diego from south of international boundary	59,314,344

Dr. Frank W. Weymouth, professor of physiology at Stanford University, arrived in Washington, D. C., during the early part of the year to take charge of the extensive program of shrimp investigations on the south Atlantic and Gulf coasts. He was accompanied by Milton J. Lindner, formerly a scientific assistant at the California State Fisheries Laboratory.

SCIENTIFIC CRUISE OF THE "BLUEFIN" IN MEXICAN WATERS

On March 30, 1931, the California Division of Fish and Game patrol boat, the *Bluefin*, sailed from Long Beach Harbor on a three weeks' cruise to Mexican waters in search of new facts about fish. The Mexican Government officials showed their willingness to cooperate by their gracious consent to the project.

The scientific staff of four will devote their study to the following subjects: E. C. Scofield, sardine eggs and larvae; H. C. Godsil, young sardines; D. H. Fry, Jr., eggs, larvae and young of mackerel; and J. H. Wales, rock fish species and where they are most abundant. Messrs. Scofield, Godsil and Fry are members of the Bureau of Commercial Fisheries staff, and Mr. Wales of Stanford University.

The apparatus consists of set lines, troll lines, a special bait net for collecting young fish, a special young fish trawl, and plankton nets for eggs. The new machinery for hauling the nets, installed a few months ago, is expected to make handling much easier, especially the depth hauls. The specimens collected will be brought back to the California State Fisheries Laboratory, Terminal Island, for further study.—Genevieve C. Wheeler, California State Fisheries Laboratory, March 31, 1931.

LOBSTER QUITE A TRAVELER

Despite his clumsy, bungling appearance, Mr. Lobster is found to be quite a traveler.

Scientific investigators for the Bureau of Commercial Fisheries of the division have just found lobster larvae at a point 160 miles out in the Pacific Ocean off Point Banda, Lower California.

This species of spiny lobster, adult, is found along the rocky bottom of the southern California coast, but has never been taken in water deeper than 50 fathoms.

The females deposit their eggs during the spring months and these eggs hatch into the larvae. Many are swept to sea and undoubtedly perish due to a lack of natural environment. These larvae grow slowly by a means of moulting in which they shed their entire outer covering. Moulting is believed to continue over a period of two years, although it is not definitely known.

These larvae are rare finds in the open ocean due mainly to their utter transparency in the water. They finally grow into a small lobster an inch or so in length. These, too, are rarely found. Those that are fortunate enough to finally locate on the inshore rocky bottoms live to adult stages during which time they move around very little.

Of course all this information may not mean very much to the fellow who doesn't like lobster, but to the one who does, it should arouse a profound feeling of sympathy, admiration and appetite.

BASKING SHARK GROWS LARGE

A report from southern California says that the largest basking shark *(Cetorhinus maximus)* on record for the district around in Los Angeles Harbor and the Santa Monica Bay area was caught a short time ago in nets by Frank Hobart.

The sea monster measured 14 feet 10 inches in length and weighed nearly 1500 pounds, according to the report. Old-time fishermen say this is the largest shark ever killed in these waters.

Basking is the largest species of shark. Edwin Chapin Starks, Stanford University, in a bulletin on the sharks of California says of the basking shark, that: "The size of the gill slits, which nearly meet under the throat, at once identifies this great shark. It has the caudal fin and caudal keels. The basking shark is found in Arctic seas and is not infrequently taken as far south as Monterey Bay. Recently one was taken at Santa Monica. It is known to reach a length of thirty-six feet. Its habit of remaining motionless or drifting slowly along the surface of the water as if basking in the sun has given it its common name. It is said to be easily approached and harpooned when thus at the surface, but its final capture is difficult and dangerous on account of the powerful blows it may deliver with its tail. In Monterey Bay it has sometimes been caught in gill nets by swimming into them and then turning over and over, wrapping them tightly about its head, closing its gill slits, and so strangling. Its teeth are smaller than those of any other shark, there being about 200 in each row. This, together with its long, close-set gill rakers and sluggish habits, indicates that it probably feeds upon small organisms, rather than upon fish or other animals that would entail swiftness in their capture."

An unusual run of these great fish in Monterey Bay several months ago caused fishermen to outfit boats for the purpose of harpooning the creatures. The catch was utilized for reduction purposes. It was discovered that the oil from the liver of these sharks is of very good quality and appeared quite suitable for salad dressing and other table purposes.

RESTORE SALMON WITHOUT TREATY

Governor Hartley of the state of Washington maintains that the Department of Fisheries of that state working in cooperation with the authorities of British Columbia can restore the sockeye salmon to its previous plentiful supply without the international commission for which there has been much agitation. Hartley contends that dual control would create conditions of utmost confusion and demoralization throughout the entire salmon industry, contending that the shrinkage in value of the sockeye catch from $40,000,000 to $10,000,000 is due less to lack of conservation than to rock slide that blocked the Fraser River. —*Fishing,* March, 1931.

FISH FORECAST SEASON

Barracuda put in an appearance in southern California waters early in February, according to Hermosa boatmen. This unusually early appearance of the "tigers of the sea" is said to indicate a very early summer.

FISH INDUSTRY LARGE

Regardless of the general business depression that prevailed over the country in 1930, the California fishing industry had a very good year. With ports at Monterey, San Pedro, San Diego, San Francisco and northern points, the industry rates as the greatest of its kind in the entire world.

According to figures compiled at the Division of Fish and Game the total estimated value of the pack for the 1930 season amounted to $26,282,218. The total number of persons employed is 7619 and the value of the plants is figured to reach a total value of $10,012,863.

Thus it can be seen at a glance that the fishing industry in California can be rated at nearly $37,000,000 for the past year, and this during an unusually low business cycle. The value of such an industry to this State and to the country is of such great importance that it would be impossible to make any reasonable estimate.

The species of fish that made up the pack are listed as follows: abalones, albacore, bonito, mackerel, salmon, sardines, shad, squid, bluefin tuna, striped tuna, yellowfin tuna, yellowtail and miscellaneous scrap, all of which made up a total pack of 5,159,239 cases.

UPLAND GAME BIRDS

ENEMY DRIVES DANGEROUS

Those who indulge in bird pest drives or wars should do so with extreme care. This is the season when much of this sort of work is carried on by hunters.

One of the great dangers attached to this type of work is that of driving the game birds from the nests and country. Results often prove to be very disastrous for the desired variety of birds as well as alleged nuisances.

Several years ago a member of the division had occasion to attend one of these drives. To his astonishment he saw hunters deliberately trample quail and other nesting game birds completely out of their nests, without giving thought as to the results. The nests were virtually destroyed and the birds were scattered and frightened away to other territories by the shouts and gunfire of the persons who were eagerly pursuing one member of a "hated" variety.

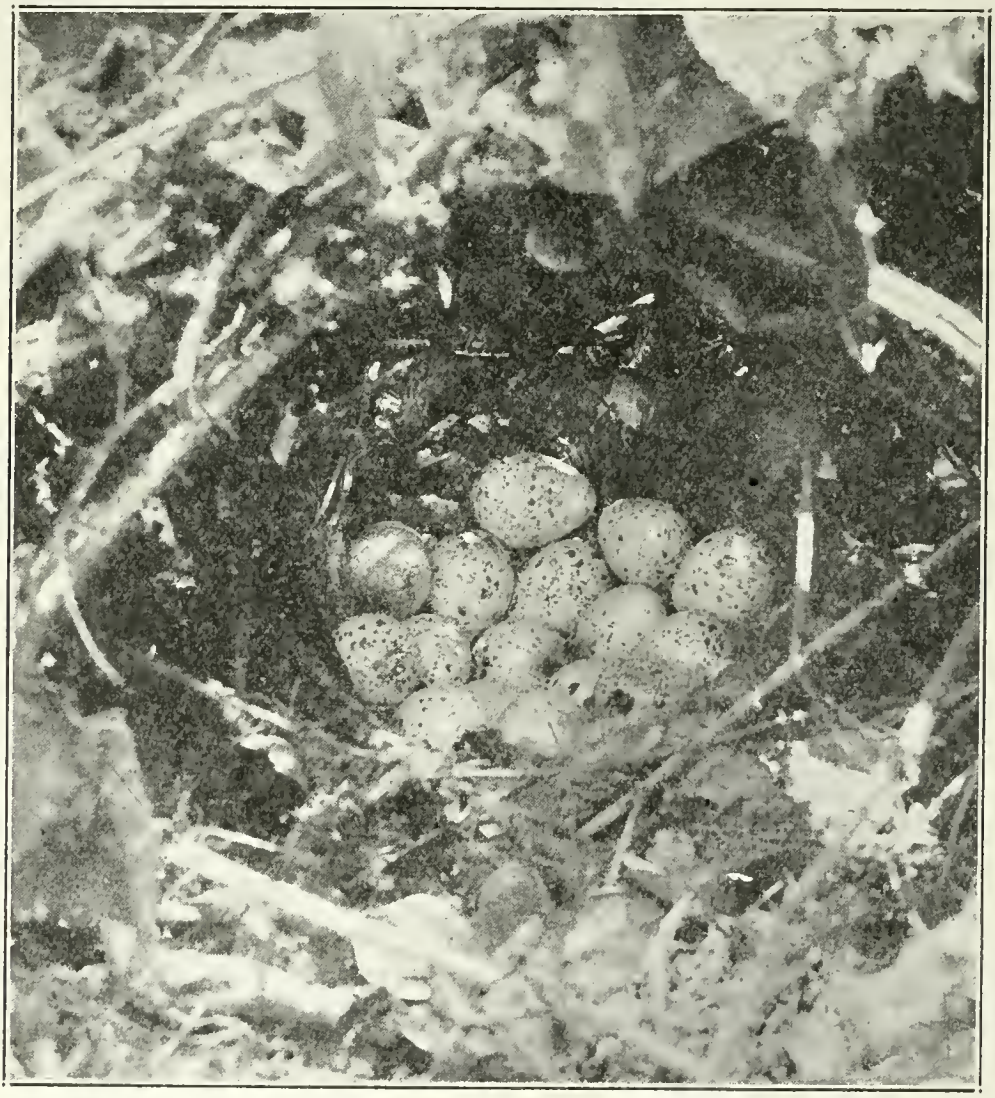


FIG. 93. Valley quail's nest in Alameda County. Those who indulge in bird pest drives often unwittingly destroy the nests of desired species. Photograph by E. S. Cheney, May, 1925.

A close watch on this particular district proved that it was many seasons before the quail and other game birds began to return, and by that time the despised variety was also replenished in numbers, thus proving that absolutely nothing had been accomplished.

If drives of this sort are contemplated, they should be made in the fall when the birds are not nesting and when the least damage is liable to be done. Before the drive, a survey should be made by competent persons. The approximate number of game birds should be estimated and this figure should be compared with observations on the numbers

desired for eradication. If the percentage is not large, the hunters might do very well to let matters stand as they are.

In making drives, competent captains or leaders should be chosen who will lead the hunters as quietly as possible and who will make it a rule to give a wide margin to the game birds at hand. Frightened birds will sometimes leave a nest, never to return, or if they do return, the eggs have become cold and hatching is impossible.

Remember, unless extreme care is exercised, a great deal more damage will be done than there is good accomplished on these drives.

GAME BULLETIN TRAVELS

It is interesting to note that a copy of Game Bulletin No. 2, "The Quail of California," by Donald D. McLean, has already traveled far to foreign lands. The copy in mind is now the property of Dr. Bias, of Prague, Czechoslovakia. Besides this foreign invasion, the bulletin has been exceedingly popular here in our own country.

QUAIL IN SONOMA COUNTY

The volunteer deputies are doing a good work in establishing quail sanctuaries throughout Sonoma County. There are now eleven quail sanctuaries, containing a total of about 1800 acres of land, upon which there are approximately 1500 wild valley quail in this locality. These sanctuaries have been voluntarily established and the area closed to quail shooting by the owners of the land, in cooperation with the efforts being made to reestablish the supply through natural channels from the nucleus of wild quail now in the field, and without the necessity of declaring a closed season for a period of years.—*Sonoma County Sportsman,* January, 1931.

MANY BIRDS IMPORTED INTO UNITED STATES

Due to the depletion of game birds in this country, it was necessary to make the biggest importation of live birds and eggs this year for restocking purposes. The United States imported 90,124 bobwhite quail from Mexico during the season ending April 30th. The birds were used for restocking barren areas, and building up stock where birds are scarce.

The U. S. Bureau of Biological Survey declared this is the greatest number of quail ever imported to this country during one season. The birds were brought in as follows: 61,922 were entered at Laredo, Texas, 18,427 at Eagle Pass, and 9775 at Brownsville. Not a single bird was reported as diseased.

Permits were issued for the importation of more than 2800 game birds' eggs from England. Most of the permits were for pheasant eggs.

QUAIL SURVEY IN GEORGIA

During the past few years the department has conducted an aggressive campaign against forest fires, and urged the farmers and sportsmen of Georgia to plant proper food and leave sufficient cover for the quail. This year we have under way a scientific, comprehensive survey of quail conditions throughout Georgia, to determine the status of the quail in

the respective sections of the State, the prevalence and effect of the various species of vermin to be found, giving particular study to the relation of the fox to quail. The survey will include a study of food and cover conditions in each section, and will seek to gather all other information upon which to base an intelligent program for conserving and increasing the supply of birds in each section of the State.

This work will be under the supervision of a man who has made a special study of quail and its enemies, food habits, etc., but the survey can not be made a success without the voluntary cooperation of the sportsmen and landowners of Georgia who are interested in the subject.

The department has prepared a questionnaire containing about fifty questions which we are very anxious to get into the hands of sportsmen and landowners who will cooperate with us. Sportsmen and

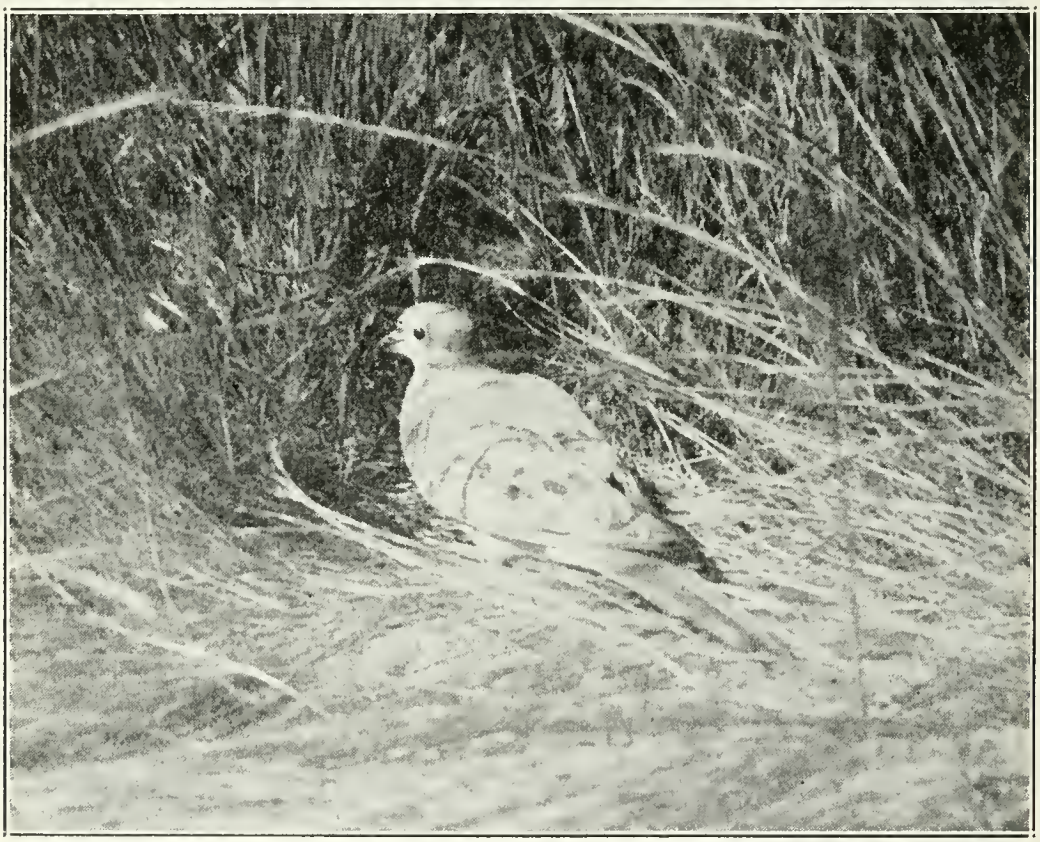


FIG. 94. Western mourning doves are prolific breeders. Nests may be found nearly every month of the year. Photograph by E. S. Cheney, May, 1930.

landowners in each section who are sufficiently interested and who will help us make the survey a success are urged to write us for one of these questionnaires and fill in the same and return to us. These questionnaires will be used as a basis for the personal investigative and research work to be conducted in each locality.

DOVE CROP GOOD

The drought last winter throughout most of the west coast favored the nesting season of doves and present indications are that there will be a large crop of this game bird this year, according to reports made from every section of the country. The dove nests in every state, and, in most, brings off from two to four broods a season.

The May broods are feathering out well and the babies of June are faring splendidly, observers report. There are yet two more broods to arrive in many sections, principally the temperate zone of the South and Middle West, for in these areas the dove nests until late summer. Two weeks are required for incubation, and often before the brood is off the nest, eggs for the next brood are laid.

Many of the eggs are lost, however, because of the excessive love-making of the doves, ornithologists point out. The pair build such a slovenly nest in the little time they snatch from "billing and cooing" that the eggs frequently roll off the almost flat surface of twigs or else fall through the loose interstices.

FOOD HABITS OF PHEASANT

The only way to settle an argument is to collect the facts, then analyze them. What the ringneck pheasant eats has produced many arguments. South Dakota and several other states have contributed some excellent information on the subject, but one of the most comprehensive reports ever published covering the food habits of any upland game bird has recently made its appearance from the College of Agriculture, University of Nebraska, under the title of "Research Bulletin No. 50, The Food Habits of the Ringnecked Pheasant in Central Nebraska."

Professor M. H. Swenk, of the Department of Entomology, is the author. He, in cooperation with Frank B. O'Connell, secretary of the Nebraska Game, Forestation and Parks Commission, and other coworkers made the investigations and collected the data.

The bulletin covers detailed findings in a number of states and concludes with the following significant statement:

"Whether the pheasant is to be classed as a bird that is beneficial or injurious to agriculture appears to be essentially a local matter. It depends not only on the abundance of the birds, but also on the kinds of crops raised and the amount of wild food available in the locality in question. * * * The capacity of the bird for doing good or harm is great, because it tends to feed heavily on the most easily available, palatable foods. * * * The evidence is conclusive that in Nebraska, as in other grain-growing sections of the United States, the pheasant is dominantly a granivorous bird. However, with little doubt a large portion of the grain eaten by the Nebraska birds studied was waste grain, gleaned from the ground.

"The economic service performed by the pheasant in eating weed seeds is not very important, not only because the total amount eaten is not very great (about 6 per cent of the year's food), but because the number of weed seeds annually escaping destruction by the birds and all others of their natural enemies is probably more than sufficient to produce as great a weed stand as the conditions of natural competition and cultivataion will permit to grow and mature.

"If the pheasant population is permitted to increase unrestrictedly in Nebraska, there will no doubt be increased injury to crops, and consequently augmented complaints by farmers; but if the birds are held down to reasonable numbers they will probably on most farms render a sufficient service by destroying injurious beetles, cutworms, grasshop-

pers, and other noxious insects as on the whole to balance, approximately, the harm they do to crops."

SEPARATE WILD AND DOMESTIC BIRDS

Do not feed game birds with domestic poultry. Game birds are most susceptible to poultry diseases, as has been proved by the grouse breeding experiments of Dr. A. A. Allen of Cornell University. They should be kept off ground contaminated by chickens.

Food should be placed in shelters regularly that the birds will make it a habit to frequent the feeding places. Quail feeding stations should be close together—one feeding station to each 40-acre tract.

Pheasants will leave a section where food is not plentiful, and will seek good feeding grounds elsewhere.

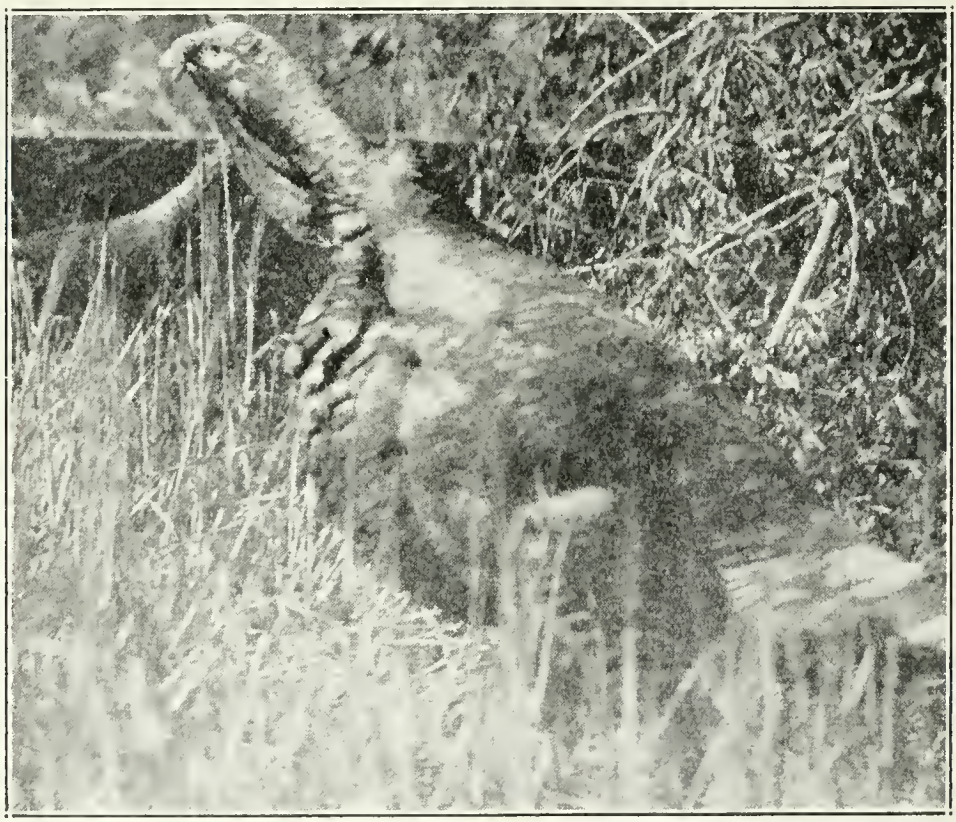


FIG. 95. Wild turkey gobbler at the State Game Farm near Yountville. Photograph by E. S. Cheney, June, 1930.

PRESERVATION OF THE TURKEY

The price of turkeys may be high, but if it were not for scientific work the Thanksgiving bird could not now be had for any money. Department of Agriculture scientists have told *Science Service* the story of the rescue of the domestic turkey from threatened extinction.

Some years ago the business of turkey raising was being rapidly wiped out as the result of the ravages of a disease known as "black head." It attacked the digestive tract and liver, and the birds seemed to have no resistance to it whatever. It was doing more than decimating the flocks; it was wiping them out altogether.

In 1895 Dr. Theobald Smith, now of Princeton University, but then one of the rising young men of the Department of Agriculture,

identified the germ of the disease. It was shown to be a parasitic protozoan, or one-celled animal. The pest attacked first in the digestive tract and then worked its way into the liver, eventually causing the bird's death.

But though the cause was known there seemed to be no method of cure or prevention. Then, about ten years ago, Dr. E. E. Tyzzer of Harvard University showed that the same germ is harbored by common chickens. These, however, are quite resistant to it, never becoming very sick, but serving as semiimmune "carriers." Turkeys kept in mixed flocks with chickens were therefore practically certain to become infected if there had ever been a case of black head in the history of the flock.

The salvation of the turkeys was accomplished by the simple expedient of segregating them from the chickens thus found to be such bad company for them. This has not by any means eliminated the disease, but it has at least made it possible to keep the turkey flocks alive. In the meantime the Department of Agriculture is attacking the problem anew, with the object of finding a positive and specific method of prevention or cure.—*Science—Supplement,* Vol. 72, No. 1874, Nov. 28, 1930.

INVENTIONS KILL BIRDS

Thousands of birds are killed each year in Pennsylvania by telephone wires, buildings and automobiles, all barriers in the way of their flight, according to a recent survey. Actual count revealed many game birds had been killed in this manner and more than 250 were found in 1930, including grouse, pheasants, quail, woodcock and snipe.

WATERFOWL

DUCK SEASON SHORTENED BY GOVERNMENT

Regulations increasing the protection of migratory birds, recommended recently by the Biological Survey of the U. S. Department of Agriculture, will affect hunters in all parts of the United States. President Herbert Hoover on March 17 approved amendments to the migratory bird regulations adopted by Secretary of Agriculture Hyde to carry out the recommendations. The chief amendment that affects all parts of the country is one that shortens the open season 15 days on ducks, geese (including brant), coots, and jacksnipe. Hereafter, the seasons on these birds will start 15 days later in the northern parts of the country and close 15 days earlier in the South. One effect of this amendment will be to prohibit the shooting of ducks, geese (including brant), coots, and jacksnipe in September in any State. The shortened seasons are prescribed because of the increased natural hazards the birds are experiencing in reduced breeding, feeding, and resting areas, brought about in part as a result of unprecedented drought the last two seasons.

A further amendment of general effect regulates the hour at which hunters can begin shooting on the opening day of the season

in each locality. Hereafter it will be illegal to hunt migratory game birds before noon on the opening day.

Other general provisions are concerned with decoys, baiting, and bag limits. Following is a summary of the regulations as received from the Federal Government:

1. *Hour of opening, first day of season.*—The hour for the commencement of hunting on the opening day of the season will be 12.00 o'clock noon.

2. *Waterfowl seasons.*—The open seasons for waterfowl (except snow geese in States bordering on the Atlantic Ocean, Ross' geese, cackling geese, wood duck, eider ducks, and swans), and for coot and Wilson's snipe or jacksnipe will be as follows:

In Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York (except Long Island), Pennsylvania, West



FIG. 96. Cackling geese rising from stubble field near Pennington, Sutter County. Photograph by H. C. Bryant, November, 1922.

Virginia, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Montana, Wyoming, Colorado, Utah, Idaho, Nevada, California, Oregon, and Washington the open season will be from October 1 to December 31;

In that portion of New York known as Long Island, and in New Jersey, Delaware, Oklahoma, New Mexico, Arizona, and in that portion of Texas lying west and north of the line described in existing regulations the open season will be from October 16 to January 15;

In that portion of Texas lying south and east of the line described in existing regulations the open season will be from November 1 to January 15;

In Maryland, the District of Columbia, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, and Louisiana the open season will be from November 1 to January 15;

In Florida the open season will be from November 20 to January 15; and

In Alaska the open season will be from September 1 to December 15.

3. *Close Season on Certain Geese.*—The season has been closed on snow geese in all States bordering on the Atlantic Ocean, and on Ross' geese and cackling geese throughout their range in this country.

4. *Brant Included with Geese.*—Brant have been included in the bag limit for geese, and only 4 geese and brant in the aggregate of all kinds may be taken in any one day, and no person may possess at any one time more than 8 geese (including brant) in the aggregate of all kinds.

5. *Decoys for Geese.*—In the hunting of wild geese not more than ten (10) live goose decoys may be used or shot over at any one gunning stand, blind, or floating device.

6. *Baiting for Mourning Doves.*—The hunting, killing, or taking of mourning doves is not permitted on or over, at, or near any area that has been baited with salt, with corn, wheat, or other grain, or with other foods placed or scattered thereon.

7. *Dove Seasons in Florida.*—The open season for mourning doves in the State of Florida will be from November 20 to January 31, except in the counties of Dade, Monroe, and Broward, where the season will remain unchanged—September 16 to November 15.

8. *Rail and Gallinule Seasons, New York and Washington.*—In the States of New York and Washington the open season for rails and gallinules (except coot) will be from October 1 to November 30.

9. *Woodcock Seasons in New York.*—The open season for the hunting of woodcock in that portion of New York lying south of the tracks of the main line of the New York Central Railroad extending from Buffalo to Albany and south of the tracks of the main line of the Boston & Albany Railroad extending from Albany to the Massachusetts State line, including Long Island, will be from October 15 to November 14. In that portion of New York lying north of the line above described, the season will be limited to the month of October.

DUCKS AND AGRICULTURE

Following is an interesting bit of news taken from the March issue of Du Pont *Game Conservation News*, which in turn gives due credit to *Outdoor America*:

"Canadian conservation officials have repeatedly called attention to the fact that agriculture is rapidly encroaching upon the remaining choice breeding grounds of the ducks in that country, where 75 per cent of the waterfowl of this continent are produced.

"Awards at the 1930 International Hay and Grain Show in Chicago, at which Herman Trelle of the Peace River country, 250 miles north of Edmonton, for the second time carried off the international wheat honors, may give Canadian wheat farmers much encouragement. But it means just the oppposite to those who are interested in the waterfowl supply of both countries.

"Canadian wheat growers have been developing more hardy varieties of winter wheat, which has made it possible for them to push the profitable wheat range farther and farther north. The section in which Mr. Trelle's prize-winning wheat was produced is one of the best remaining waterfowl ranges in Canada."

GOLD-BEARING DUCK

Last December Franck Troeh, world-famous trapshooter of Portland, drew a nice fat mallard hen. She had promised only sport and a tasty meal, but gave much more. Stowed in her crop along with the usual food-grinding pebbles were the virgin nuggets, some an eighth of an inch through.

Duck hunting promptly leaped in popularity. Until the close of the season the winter visitors were literally "panned"—for gold.

Now many Oregon sportsmen are going about preparing natural attractions for ducks with greater zeal. They are planning a royal welcome for waterfowl guests in the fall, and hoping to find a gold-bearing duck which also wears the Biological Survey's identification band—and a clue to the mysterious whereabouts of a northern gold field.

DUCKS DESTROYED BY RADIO

During the last days of the passenger pigeon the telegraph was invoked to spread the news of the movements of the flocks, and the slaughterers were aided in their work of extermination. We note that some of our States are now using the radio to apprise hunters of the progress made by the southward migrating ducks. From the use of the method within States the movement has been extended to include service to other States along the path of migration. We thought that the refinements of decoying and baiting, aided by blinds and the high efficiency of weapons, all conspired sufficiently to reduce the diminishing supply, but it seems that each development of science is to be requisitioned.

DUCKS AND BLACK FLIES

Another reason for swatting the black fly has been discovered at the University of Michigan. Their bites are killing many young ducks.

They are the same black flies which annoy man. In the ducks they introduce a blood parasite which causes death in about two weeks.

The fly bites, however, are harmless to adult ducks.—*Pacific Sportsman,* March, 1931.

DUCK TRAVELS FAST

A mallard duck, banded on November 23, 1930, at Big Suamico, Green Bay, Wisconsin, was killed five days later near Georgetown, South Carolina, according to a report to the United States Biological Survey. This is a record for individual speed of migration, the bureau says.

BANDED DUCKS SHOULD BE REPORTED

Sportsmen going afield this season to take daily and seasonal bags of wild ducks and other game birds may find occasionally a numbered aluminum band on one leg of a bird. Bird-banding cooperators of the

Bureau of Biological Survey of the United States Department of Agriculture, in advancing its studies of North American waterfowl have banded game birds at more than 50 stations in the United States and Canada, from the Arctic regions south to Louisiana and Georgia, and from Maine to California. The Biological Survey desires a report on every banded bird that is recovered, and requests the cooperation of sportsmen. The report should state the number printed on the band (including any series designation, such as A, B or C) and the date and locality where the bird was obtained. In return, the Biological Survey will tell the person rendering the report where and when the bird was banded, and send interesting information on the application of the banding method to bird study.

Bird banding, as conducted by the Biological Survey and its 1700 cooperators, furnishes a means of obtaining information regarding conservation measures. The banding records of the bureau have furnished much information on hunting and conservation problems, such as showing the regions that are visited by particular concentrations of birds. The solution of these problems means much to the perpetration of the sport of wild-fowling, and sportsmen are accordingly urged to examine the ducks and other wild fowl in their bags and report banded birds to the Biological Survey.

BAG-LIMIT GOSSIP

The following interesting data was gathered by Deputy E. C. Vail, forwarded to Captain O. P. Brownlow, thence to the Bureau of Patrol, and then, by hook or crook, was pilfered for this issue. And so—

"October 1, 1929, there were approximately 5457 ducks killed in Pond district. These figures were arrived at by getting the number of shooters on each club, which was a total of 321 men, averaging 17 ducks each.

"October 1, 1930, there were approximately 3030 ducks killed in this district, 303 shooters averaging 10 ducks each. These figures were arrived at by 75 licenses counted from the different clubs.

"January 15, 1930, there were 309 shooters averaging 9 ducks each, or a total of 2781 killed. These figures were arrived at by 41 bags counted.

"January 15, 1931, there were 293 hunters averaging 7 ducks each. Total, 2051 killed. This average was arrived at by 57 bags and licenses counted from the different clubs.

"These licenses and bags were counted from the various clubs so as to give us a general estimate. And while these figures are not accurate, they give an idea of the number of birds saved by the 15 bag limit."

SWAN CREATES SHORT-CIRCUIT

One of the swans that winter in the Alvarado salt marshes has gone where bad swans go—and his passing caused no little grief among the residents of that part of Alameda County. It wasn't that they cared particularly about the swan; only he cut off their lights and telephones just as he was passing on. He tried to fly between some power wires and short-circuited the line. One wire fell across a nearby telephone line and put both services out of commission for a time.

PELICANS MUST LEARN TO FISH

Discovery was made a short time ago that many pelicans in the Santa Monica Bay district have never learned to fish for their daily subsistence. For years the pouch-billed water birds have dozed sleepily around the wharves and fishing vessels and lived entirely upon the fish proffered them by generous fishermen. It was not necessary for these pelicans to skim the waves in pursuit of schools of fish and make the beautiful dives so attractive to observers; thus they never learned the art.



FIG. 97. Brown pelicans feeding around sardine boats in San Pedro harbor. Photograph by E. S. Cheney, November 8, 1928.

But a condition occurred in January that almost spelled finis for such a languorous mode of living. Rough seas drove the fish to quieter and deeper waters. Fishermen failed to make the usual catches and there was less food to toss to the birds.

Some cases were found where birds had almost starved to death. That the condition was caused by a lack of schooling is proven by the fact that scores of regular birds found little difficulty in doing plenty of their own fishing.

FURTHER OCCURRENCES OF EMPEROR GEESE IN CALIFORNIA

Following is a field note taken from the January-February, 1931, issue of *The Condor*:

Fragments of an emperor goose (*Philacte canagica*) are contained in the Museum of Vertebrate Zoology under No. 52036, by gift from Mr. Franklin J. Smith of Eureka, from a bird found dead on the beach south of Buhnes Point, Humboldt Bay, March 1, 1925. This find was witnessed by both Mr. Smith and Mr. Bertram O. Betterley; the bird, however it met its death, had been partly destroyed by seagulls. Mr. Smith stated that this is the first record of the species known to him for Humboldt Bay since 1884, when the bird recorded by Townsend (*Auk*, 3, 1886, p. 491) was taken.

Fragments of another emperor goose are in this museum (No. 54483) that were saved from a bird that was killed on Pit River, near McArthur, Shasta County, January 20, 1930. This goose was sent by Mr. F. L. Fleming of the Fall River Joint Union High School, who stated that the bird was found by boys on the river with other geese that "became very poor while their feed was covered. From time to



FIG. 98. New federal waterfowl refuge at Salton Sea.
Photograph by E. S. Cheney, December, 1929.

time some were found stuck on the ice by the tips of their wings." This last record station is farthest interiorwards, that is, away from the sea coast (some 140 miles), of all records of the emperor goose to date.—J. Grinnell, Museum of Vertebrate Zoology, University of California, Berkeley, December 7, 1930.

REFUGES AUTHORIZED BY GOVERNMENT

The Migratory Bird Conservation Commission, of which Secretary Hyde of the Department of Agriculture is chairman, has authorized purchases of lands by the Biological Survey for migratory game-bird refuges in Florida, California, North Carolina, and Nebraska, aggregating 73,780 acres. The cost to the Government will average $5.28 an acre.

The four proposed refuges had been surveyed previously by biologists and land valuation experts of the Biological Survey, and the

Department of Agriculture had approved their acquisition as units in the nationwide system of refuges authorized by Congress.

The new Florida refuge will extend about 12 miles along Apalachee Bay, in Wakulla, Jefferson and Taylor counties, and will be known as the St. Marks Migratory Bird Refuge. It will contain 13,981 acres.

The new purchases in California will add 8,982 acres to the Salton Sea Wild Life Refuge, created by executive order of November 25, 1930. The purchase authorized, together with the public lands recently set aside by the president, will create a refuge of more than 24,715 acres for waterfowl and other migrants in the Imperial Valley.

The Swanquarter Migratory Bird Refuge will be established in North Carolina under the new authorization. This will consist of 11,778 acres in Hyde County, on Pamlico Sound, and together with intermingled areas of water will make an administrative unit of about 20,000 acres.

In the sandhills of western Nebraska the purchase of 39,038 acres is authorized for the establishment of a migratory bird refuge in an area resorted to by great numbers of waterfowl in the nesting season. This is in Garden County and will be known as the Crescent Lake Migratory Bird Refuge.

The Migratory Bird Conservation Commission, which was created by the act providing for a ten-year program of refuge acquisition consists of Secretary Hyde of the Department of Agriculture; Secretary Lamont of the Department of Commerce; Secretary Wilbur of the Department of the Interior; Senator Norbeck of South Dakota; Senator Hawes, of Missouri; Representative Ackerman, of New Jersey; and Representative McReynolds, of Tennessee. Rudolph Dieffenbach, in charge of land acquisitions of the Bureau of Biological Survey, is secretary of the commission.

The new purchases authorized, together with those previously approved by the Commission, and those established by executive orders since the inception on July 1, 1929, of work under the Migratory Bird Conservation Act, make a total of 158,167 acres that will become inviolate sanctuaries for the conservation of migratory birds.

The ultimate objective is the establishment of one or more such refuges in each state of the union. The act authorizes annual appropriations for ten years for the purpose of carrying out this objective.

MAMMALS

GAME PLENTIFUL IN EARLY DAYS

Game conditions as they existed years ago in California are always a source of wonder and interest to the present day sportsman as well as the historian. There appeared in the *Hanford Daily Sentinel,* on March 24 this year, a very interesting account of California wild life under the heading "Pioneer California Sketches" by H. C. Bailey, and which was compiled by F. F. Latta.

The writer gives an excellent portrayal of affairs as he saw them and the material is reproduced herein as follows:

California was somewhat deficient in varieties of game in comparison with the southwest. But what it lacked in variety it more than compensated in quantity.

At the head of large game were the grizzly and cinnamon bears. Next came the elk, black-tailed deer and antelope. All except the elk were abundant; the bears rather uncomfortably so to stockmen. These bears were the greatest pork eaters I ever knew and in addition never objected to a young colt or calf or a good melon patch.

The average citizen, though he had no love for him, was willing to leave him alone if Mr. Bear would do likewise. I never knew of their killing but one man in our vicinity. It happened a little more than a mile from our house. We caught a huge old fellow in a log trap and had bear meat galore, but it was poor eating.

The California elk was a magnificent animal and sometimes dressed 700 pounds with antlers six feet wide. They were not so plentiful in the valleys as the other game, choosing the mountains for their home. Their flesh was rich, juicy and fairly tender.

The black-tailed deer claimed a home wherever there was timber or thickets, and their number was legion. The Indians never hunted them, so they increased like a flock of sheep and were easy prey to the hunter's rifle. In the winter of 1856–57 two hunters on the head of Stony Creek collected 600 skins, leaving the meat to waste. Such vandalism soon greatly diminished the supply.

The antelope is a plains animal and only takes to the mountains for self-protection. They always went in droves and I have seen drove after drove of 200 in a band, on the plains where the towns of Williams and Willows now stand. They were, both in form and motion, the prettiest and most symmetrical animal I ever saw.

They didn't bound like a deer when running, but seemed to move almost without effort and on a perfectly horizontal line.

The flesh of a fat antelope was the best meat I ever ate. We depended the first two years of our stay entirely on game for our meat supply. It cost just one-half as much as beef. Hunters supplied us just as the butcher wagons do rural districts now.

After the winter floods the water on the plains was confined to water holes. The hunter laid at the holes in the afternoon, killed what he wanted for the next day, and had it all sold out before noon and returned to the holes for another supply. A hunter told me that, with a rifle he killed four antelope at one shot.

The result was that in two years they had almost all been killed off or run back into the mountains. It was more difficult to kill elk and deer and they were fairly plentiful when antelope hunting ceased. But the antelope was difficult to stalk, had a keen scent, shunned all kinds of cover, and when in the open always kept sentinels out. Their carcass weighed from 60 to 80 pounds.

Our game supply was precarious after the antelope was gone. We still had elk and deer when the hunter was successful. Of small game we had none but ground squirrels and waterfowl. But the supply was limitless.

Were I able to write a true statement of the numbers, I could hardly expect to be believed. If I were to attempt to I would do it by acres instead of attempting the number of fowl.

They embrace, so far as I know, all varieties common to America; four distinct varieties of geese and every kind of duck I ever had or have seen, besides an endless variety of the snipe and gull families.

We killed and ate our own geese and ducks. One week's consumption consisted of 36 mallards and three geese and still they tasted good. I have looked out over a level plain, and as far as I could see it looked like a compact flock of geese. I have seen the foothills twelve miles from home appear as though they were covered with snow for miles, so thick were the white brant geese.

DEER GET TRANSFERRED

Deer on the floor of the valley in Yosemite National Park became so numerous that they threatened to destroy many species of wild flowers and shrubs which park officials are trying to conserve for the enjoyment of the public. The park authorities, therefore, decided to transport a number of them to the Hetch Hetchy region of the park, which had been almost depopulated of deer by the hoof-and-mouth disease epidemic of 1924.

According to information recently received from Mr. C. G. Thomson, the Superintendent of Yosemite, during the last six or eight months of 1930, the service trapped and transferred 93 deer of all ages, all of them black-tails, from the Yosemite Valley.

The deer on the floor of the valley are accustomed to being fed by tourists and local residents, and are very tame. They are easily trapped—but then the officials found that they are no longer peace-loving animals. They fight for freedom and actually fight with each other during the forty-five mile ride to their new home.

Park officials say the transferred deer will remain where released, as thirty-five head transported to the same locality in 1929 are still in the region where liberated.

The biggest difficulty in transferring deer from over-populated areas is to catch them. But handling them is nothing like handling lambs, and those who try it must be prepared for some real surprises.

Drugged bullets, producing sleep instead of death, may solve the problem of how to capture deer in overcrowded sections of the country for shipment to other sections and states where deer are scarce.

Major Barnett Harris, African big game hunter and inventor of the drugged or hypodermic bullet, has established headquarters at Alpena, Michigan, waiting for the first heavy snows to drive the deer into their yarding grounds so that he can test the bullet's effect on these animals.

His experiments will be carried on under the direction of the Michigan Conservation Department.

Major Harris has already tried his invention successfully on big game in Africa. His tests in the Michigan area of heavy deer concentration during the yarding-up period will be directed toward ascertaining the type and amount of drug necessary to bring temporary insensibility without serious injury to the deer. The bullet does not penetrate, but injects the drug on the hypodermic principle.

Conservation and park authorities of the country are watching the experiment in the hope that it may furnish a solution to an increas-

ingly trying problem now facing game restoration projects in several parts of the country.

While most of the country is confronted with shortage or actual extinction of big game, other sections, notably Pennsylvania, portions of Michigan, the Kaibab National Park in Arizona and the floor of Yosemite National Park, are losing thousands of deer yearly from overcrowding and starvation.

Heretofore shipping deer from one region to another for a more even distribution has been found impracticable because of the expense of trapping them, and the fatalities resulting.

The drugged bullet, if it will enable hunters to fire at a deer and put it quietly to sleep, may supply an effective remedy and aid in a rapid nationwide restoration of big game.

LATEST IN DEER DAMAGE

Now that the deer population has been increased to a good safe margin, about all the animals seem to do is to get into some sort of mischief. If it isn't crop damage it's something else.

Here is the latest report from the *Roseville Press*: "J. A. Lundy of Y street, Sacramento, saved the lives of three deer on the state highway near Weimar, Sunday afternoon, but caused a traffic tieup, bruised heads, broken bumpers and bent fenders. Lundy stopped suddenly on the highway when traveling about 35 miles per hour. The cars following him from the snowline did not have an opportunity to stop in time.

"The three deer crossed the highway and climbed the bank, disappearing in the darkness."

TAGGED DEER KILLED IN MICHIGAN

Deer No. 51, probably the only proud possessor of a metal tag in his ear in the whole upper peninsula met an untimely end during hunting season. So did a great many others, but this young fellow was a sacrifice in the cause of science.

Last winter he ventured into the deep trap at Blaney Park where the tag was fastened into his ear and then released. Blaney Park officials received a letter from the Department of Conservation saying the deer was killed near Walsh in the northern end of Schoolcraft County. This is about 20 miles from the trap at Blaney Park.

While only one deer was tagged last winter, the trap will be operated again this year as soon as the bucks shed their horns. The trap at Blaney Park is the only one operated by the Department of Conservation in the upper peninsula.

Leroy Bushek shot a deer, but it ran away with his license.

He placed his tag on the animal's ear as required by Michigan game laws, and went into camp to notify his companions and get help.

When he returned the "dead" buck was gone, tag and all. Lack of snow prevented tracking the wounded animal.

DEER HUNTERS CHIVALROUS

For many years the does were protected from hunters in Pennsylvania while the manly bucks bore the brunt of the sport. Then

experts discovered that the deer ladies had increased so greatly as to overshadow the bucks. They were crowding available ranges with "old maids," eating the woods bare, and in many instances even sprouting antlers.

Special open seasons on does were declared, but until recently sportsmen were too chivalrous to approve of these.

Now the Pennsylvania Game commission has introduced a bill to give does official "equality." It would let the sportsmen hunt the females as well as the males during the same open season, but would also authorize the commission to close seasons on either sex at will, for the sake of keeping a proper balance between the two.

RAINING HAY IN ALASKA

The miracle of the manna which fell from Heaven upon the Israelites was repeated last winter in Alaska, with a starving herd of deer as the beneficiaries.

Instead of manna, however, the astounded deer saw two bales of hay come tumbling out of the skies every day to furnish food on a barren seashore, according to the American Game Protective Association.

The deer had been driven out of their native forests by an unseasonable snow which hid their food, and sought refuge on the seashore. Here they were on the verge of starvation until the citizens of Juneau and several other towns collected a fund with which to pay an aviator for several trips to the herd.

On each trip the pilot carried a bale of hay on each side of the plane, dropping them overboard beside the deer. The "miracle" is being continued until the deer are able to find natural food in their native forests.

PROTECT RARE ANIMALS

Two venerable moose who sought refuge 15 years ago near an abandoned mine on Rock Creek, in Montana, seem to have resolved to repopulate their neighborhood.

When the original pair were first noticed near the old mine in 1915 they were the only pair known to exist on the west fork of the river. But a recent census of the moose population there by Forest Ranger Stanley Lukens showed more than 200 head, according to a report to the American Game Protective Association.

This increase of 10,000 per cent in 15 years was accomplished under the protection of a year-round closed season in that state.

ANTELOPE RANCH IN MONTANA

Who wants a nice herd of antelope for his back yard?

Candidates with the right kind of back yards—containing a few thousand acres of grazing lands—are invited to line up at the right and help W. P. Sullivan, stockman and banker of Square Butte, Montana, solve the question of what to do with an overly successful game preserve.

Mr. Sullivan took pity a few years ago on the antelope, and in the hope of saving these graceful animals from complete extinction set aside a little 8000-acre corner of his ranch as an antelope refuge.

There were a dozen or so antelope on his preserve then, but now Mr. Sullivan is getting worried. The herd has grown to 450, and another year or two will probably see it near the 1000 mark. Then he will face the need of turning the animals out to graze on open prairie where the species is rapidly being wiped out by lack of feed, or human enemies and other causes, or else turning the whole of his ranch into an antelope farm.

Mr. Sullivan's dilemma has been brought to the attention of the American Game Protection Association officials, who regard his success with the dainty antelope as proof that game of all kinds can be restored in quantity if farmers and other landowners are encouraged to interest themselves in this phase of conservation.

Sportsmen of the United States extended this encouragement, these officials point out, when the American Game Conference in New York on December 2 adopted a new game policy declaring their belief that landowners who foster the wild life on their properties as a "secondary crop" are entitled to compensation for their efforts.



FIG. 99. A survivor of a once prolific species of North American mammals, the prong-horned antelope. Only a few scattered herds have been spared by civilization in California. Photograph by E. S. Cheney, May, 1929.

UNUSUAL WINTER DATA ON ELK

With the lightest snowfall on record for many years in Jackson, Wyoming, the highway to Rock Springs and Kemmerer, Wyoming, was reported to have been open to travel the entire winter, and motorists from Wyoming, Idaho, and Utah were able for the first time to drive in their own cars to see the elk in their winter habitat on the Elk Refuge near Jackson. Reports to the Biological Survey, of the U. S. Department of Agriculture, which maintains the elk refuge, say that in the first week of March the elk were in exceptionally good condition. They had not concentrated on the feeding grounds to take the hay ordinarily spread before them at this season, but were widely scattered and rustling for themselves on the mountains in the vicinity. The ground was reported bare in places but frozen to the depth of three feet. Absence of snow, it is feared, may lessen the irrigation water for the hay meadows later on, but the reservation protector, Almer P. Nelson, states that unless it should become necessary to feed the elk before the end of the winter, the supplies of hay on hand can be carried over for next season. Thus, if there should be only a slight yield of hay next year, because of any shortage in irrigation water, the refuge will be prepared to care for the elk, even through severe weather conditions. Ranchmen in the vicinity, however, have been feeding their cattle for the last three months, and most of their hay will be gone before their pasture lands are ready for grazing.

GRASSES KILL MAMMALS

The sharp, saw-toothed seed parts of squirreltail grass and other similar grasses on the Western ranges cause the death of many elk, deer and moose, the Biological Survey finds. The needlelike tips of the seed cases pierce the tender membranes in the animals' mouths. The jagged edge of the seed case resembles a porcupine quill, and after it has penetrated the lining of the mouth, every effort of the animal to get rid of it only results in further embedding the seed into the tissues. These injuries may become infected and lead to abscesses and eventually death. Occasionally an animal is found dead from starvation because of a great wad of grass lodged in one cheek and made it impossible for it to eat.

The Biological Survey is attempting to eradicate such objectionable grasses from the Elk Refuge in Wyoming and from the Sullys Hill Game Preserve, North Dakota, where the trouble has been in evidence.

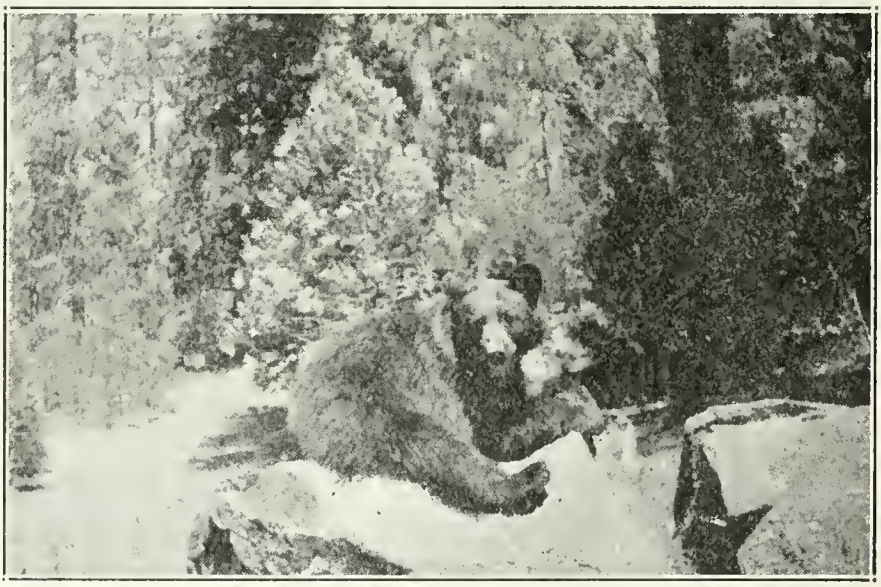


FIG. 100. Bruin is always getting into mischief and then has to stand trial. This fellow was probably thinking of some sort of deviltry when the camera arrived. Photograph at Yosemite by Miss Miriam Gibbons, 1916.

BEARS ON TRIAL IN NEW HAMPSHIRE

The bears' enemies charge they are stock killers and want them placed on the predatory animal list, subject to destruction at sight, according to reports from the state of New Hampshire.

Black bear criminals are like many human criminals—their straying from the straight and narrow may be due to the "system" and to temptations in time of weakness.

The black bear is only a "clown of the woods," lovable, harmless to other animals and to people, invaluable as game and as an attraction to tourists.

The Pennsylvania Board of Game Commissioners fought this same fight years ago. Since then black bears have increased there even in sheep-raising sections on the most friendly and easy-going terms with all other creatures. Today several counties in Pennsylvania derive

nearly as much income from bear hunters as they do from their farm products.

Pennsylvania saved its bears from the rogues gallery by studying "bear criminology." Experts found that black bears never fell into the wayward path of stock-killing unless tripped up by the force of circumstance. Stockmen did not properly dispose of dead animals, and in early spring, when extremely hungry, bears naturally acquired a taste for illicit food.

Pennsylvania reformed its bears by removing this temptation, and apparently has never regretted its psychological maneuver.

Bears in the national forests of California and Oregon that like to claw and knock down the green and white enamel signs posted by the United States Forest Service for the information of the public, are due to get the shock of their lives. A forest ranger has invented a contrivance consisting of a battery of dry cells, coil box and wires that may be attached to signs, which is warranted to jolt old bruin with volts of high-powered juice every time he monkeys with Uncle Sam's property.

BUFFALO KILLED BY ARROW

Recently workmen on a new California railroad extension unearthed the skull of a huge buffalo in which was lodged an Indian arrow. The arrow had penetrated the animal's eye socket and the death-dealing implement had remained in its place through, no one knows how many years.

This is the first definite evidence to prove that buffalo roamed the plains of Lassen County once so famous for its vast herds of antelope.

This skull and arrow were sent to Westwood and it is to be hoped that it may find a final resting place in the California Academy of Sciences on account of its unusual nature and its biological importance. —*Pacific Sportsman*, March, 1931.

WILD HOG HUNTS

Early prospectors who took gold from the California hills, left pigs in its stead—probably unintentionally, for it is believed the animals escaped from fenced corrals.

As a result Walter Dixon, owner of Las Lomas rancho, in the hills of Sonoma County, recently introduced wild hog hunts as "no ladies game."

Hunters attracted by the novelty of the sport found the progeny of prospectors' pigs have reverted to lean, lank, and husky tuskers, as wild and vicious as any ancient swine forebears.

CARRIES HIS OWN DINING TABLE

The sea-otter feeds on the bottom of the ocean, gathering small urchins, small crabs, etc., often at a depth of 180 feet. Returning to the surface with the collected food held between his teeth, he then turns on his back using his breast as a table upon which to lay the catch.

UNIFORM FUR LAWS URGED

A digest of the fur laws of all the states and of Canada, Newfoundland, and Mexico, including such restrictions as seasons, bag limits,

prohibited trapping methods, and licenses, and information on possession and sale of animals and furs, shipment and export, propagation, and bounties, is presented in Farmers' Bulletin 1648-F, "Fur Laws for the Season 1930–31," the sixteenth annual summary of its kind compiled by the Bureau of Biological Survey and issued by the United States Department of Agriculture.

Legislatures of six states (Kentucky, Maine, Massachusetts, Mississippi, Rhode Island, and Virginia) enacted laws directly affecting fur-bearing animals since last year's bulletin on the fur laws was issued. In several other states changes in fur laws were made by regulations or by order of administrative officials. The general trend of the legislation has been to increase protection afforded fur-bearing animals, though there has been some liberalization in the trapping restrictions locally.

"With the great numbers of trappers in the United States ever more intensively plying their trade, and with areas that are suitable for the production of wild life becoming more restricted each year, it is inevitable," says the bulletin, "that there must be, in the not distant future, a serious depletion in the sources of our fur supply, unless uniform measures are taken to check destructive practices and to insure that trappers shall take the annual surplus only and not further reduce the breeding stocks. Something can be done through changing open seasons on certain species, by completely closing the season on those most seriously affected, and by adopting such other measures as would tend to prevent the killing off of the fur bearers faster than they are produced. Prescribing a seasonal limit on the number of any species that might be taken would be an effective remedy if applied to fur bearers other than those raised in captivity on fur farms.

"It is essential to effective administration of the fur resources that state officials charged with the execution of fur laws have definite information regarding the number of fur animals taken in the respective states each season. Many states require licensed trappers to submit a report of the number of each species taken annually by them. Of thirty-one states that do not prescribe such reports by trappers, seven do require fur dealers or buyers to report on their transactions. Though universal application of this requirement would not disclose the number of fur animals actually taken in any one state, because of the fact that in practically all states residents may trap on their own lands without a license, it would give comparative figures on the relative number taken annually. A summary of such reports containing comparable data would furnish most valuable statistical information for economic studies of the fur situation in the entire country, as well as for the framing of legislation to control the annual take.

"If the several states would adopt uniform regulations for the licensing of trappers and the rendering of reports by them, the information resulting would be helpful to the individual state conservation departments and to the fur trade of the entire country."

The bulletin may be obtained free from the Office of Information, U. S. Department of Agriculture, Washington, D. C., as long as there is a supply available for free distribution.

BADGER IN BAD WITH AIRMAIL

Badgers, whose burrows menaced Uncle Sam's Pony Express in the early days of the West, have bobbed up again as a danger to the latest in mail carriers—the airplane.

Holes dug by these animals have presented a serious hazard to planes landing on the field at Wamsutter, Wyoming, the Biological Survey has informed the American Game Association.

The badger is considered valuable as a fur-bearer and rodent-destroyer and will continue to receive encouragement—outside of landing fields.

TWELVE-POUND HOUSE CAT

A recent report from an Eastern state reveals that a 12-pound semiwild domestic cat was shot from the top of a large hemlock tree. The cat measured three feet from tip of head to tip of tail. In coloration it is a confused mixture of blacks, browns, grays and whites and the animal was somewhat tigerish in appearance. The specimen will be mounted. This is believed to be a record.

Missouri Game and Fish Department reports that every time a hunter kills a semiwild cat he can easily figure that he has saved his daily bag limit of bobwhite quail. A checkup of the results of the cooperative pheasant egg hatch shows that after the 26,000 eggs had hatched, cats caused more deaths of young pheasants than died of natural causes. The toll taken by predatory animals and hawks was very meager in comparison to the toll taken by cats, the report filed by the 1600 persons who received eggs revealed. Sportsmen are urged to do their part in curbing the depredations caused by the common house cats permitted to run wild.

Farmers who permit cats to roam on their places are keeping away birds which aid materially in destroying insect pests. City dwellers must be content with only empty bird houses if they keep cats, bird authorities point out, as feeding places, houses and baths are not sufficient incentive for birds when their greatest natural enemy, the cat, is about.

More than 300 semiwild house cats have been killed in Southern Butte County by an expert hunter for the Feather River Rod and Gun Club in California, according to reports coming to this office. Stomachs of 100 of these cats were opened and in 99 of them was found bird meat, principally duck and quail. Only one cat was found to have fed on mice.

This gives some idea of the importance of elminating these clever creatures from our game lands.

PUGNACIOUS SQUIRRELS IN ALABAMA

Squirrels are quite capable of holding their own in a hard fight even though greatly outclassed in a matter of size and strength, according to a bulletin of the Department of Game and Fisheries of Alabama.

S. E. Beasley of Montgomery reports the complete rout of an English collie by a squirrel. The dog had treed the squirrel and was proclaiming its victory by barking loudly. The latter came slowly

down the tree and then jumped on the dog's back. The surprised animal immediately took to his heels and kept running after the squirrel had jumped off.

NO VISITORS WANTED

A creature has been found which knows how to deal with visiting relatives.

The pocket gopher plugs up his doors and refuses to tolerate any visitors at all, maiden aunts or otherwise, according to an extensive report just completed by the United States Biological Survey.

This ground-burrowing rodent is so unsociable, the study disclosed, that when two tunnels accidentally run together, the animal immediately builds a wall of earth to keep it's neighbors out.

MISCELLANEOUS

HOW TO TREAT FOR SNAKE BITE

If you are bitten by a venomous snake don't run or get overheated, excited, or take alcoholic stimulants, for either of these conditions speed up the blood stream and distribute the poison much quicker throughout the system, lessening your chance of life. Apply first aid measures, bleeding and suction of the fang wounds, and get a doctor as soon as possible.

More than 1000 cases of venomous snake bite were reported last vacation season. More are expected this season because of the increase in numbers that take their vacations in the outdoors and also a marked increase in the number of venomous snakes, attributed to increase in agriculture, which favors snakes.

Venomous snakes of the United States are the rattlesnake, the copperhead, the cottonmouth or water moccasin, and coral snakes. These snakes and their sub-species range in practically every state; only Maine, New Hampshire and Vermont are nearly or quite free of them.

Contrary to belief, venomous snakes range where population is thickest. The rattlers and copperheads are notoriously thick in five of the most densely populated states, New York, New Jersey, Connecticut, Massachusetts and Pennsylvania, acording to Dr. Raymond L. Ditmars, recognized as one of the greatest authorities on snakes. Water moccasins inhabit the entire South, living principally along streams and swamps; the coral snakes are Southerners by choice. Copperheads range in the Eastern, Southern and Southwestern states; and the rattlesnakes cover practically the entire country.

Most snake bites are on the arms or legs, according to a survey of treated cases. Because of this a lone person can usually administer first aid to himself. This should consist of applying a ligature or tourniquet a few inches above the bite; most any strong cloth will do or even a shoelace. Do not apply it too tightly, but firmly enough to retard circulation returning through the veins toward the heart. The

tourniquet should be released every 10 or 15 minutes for about a minute, else gangrene may set in.

A crosscut incision should be made at each fang mark. Use a clean knife or razor blade and cut all the way through the skin about one-fourth inch deep and one-half inch long. Some of the venom will escape with the induced bleeding. Then apply strong suction to these incisions. Many sportsmen now carry an ordinary breast pump that can be bought at any drug store for a few cents; if the mouth is used there is danger of repoisoning through bad teeth or raw places in gums or walls of

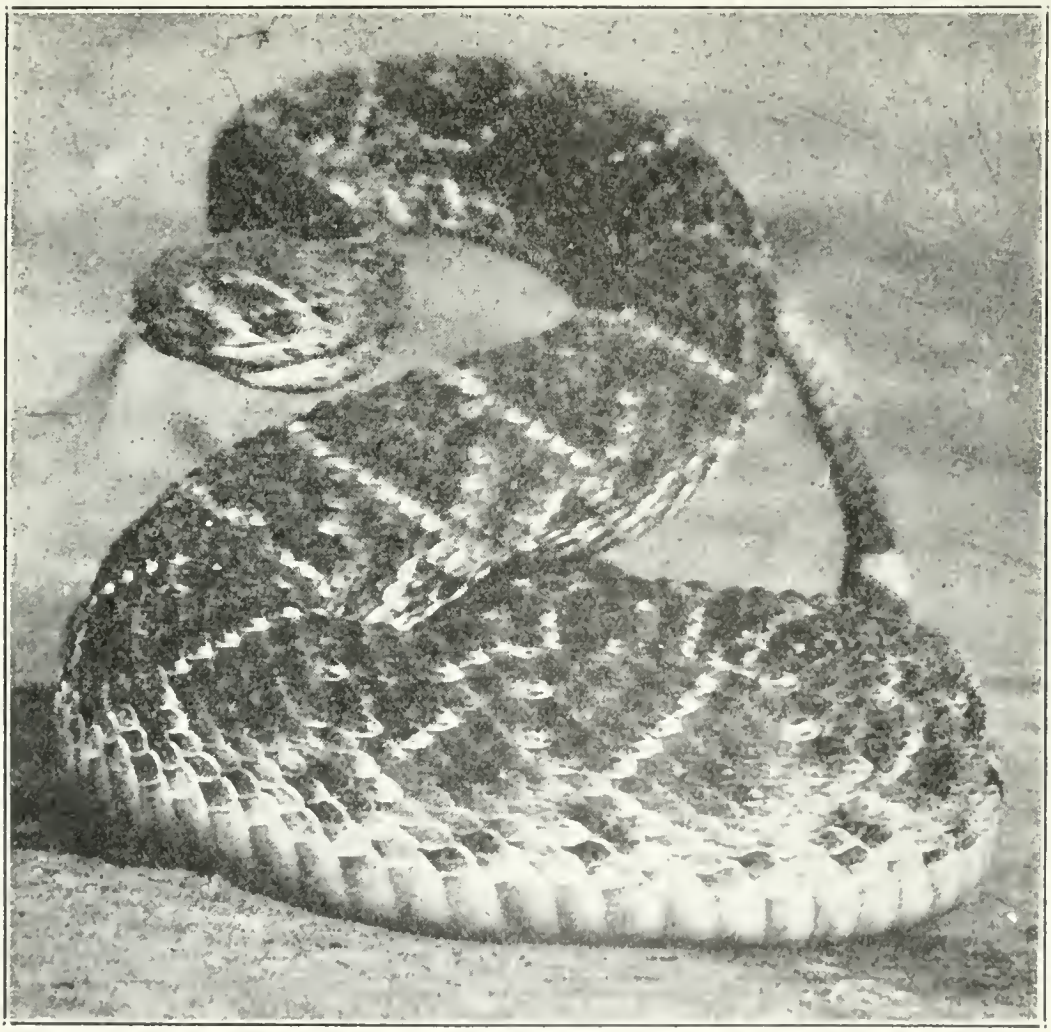


FIG. 101. Desert diamond rattler ready for business. Note that both tongue and rattles are in motion—it must have been an exciting job for the photographer. Photograph submitted through the courtesy of H. C. Robbins, Oakland Post-Enquirer, April 7, 1931.

the mouth. With either method suction should be kept up for 20 minutes of each hour for 15 continuous hours or until swelling ceases. In any event get a doctor as soon as possible.

Other advices given is not to take any alcoholic stimulants because alcohol increases circulation and distributes the poison much more rapidly. Many authorities now condemn an old method, that of injecting potassium permanganate, which is now said to be of no value as an antidote, and don't, for your sake, depend on snake-bite "cures" or home remedies; most are founded upon fiction or superstitions.

Remember these are only first aid measures and recommended as such; play safe and get a doctor as soon as possible.

HOW ABOUT THESE ROUGH FISH?

The Fish Rescue Bureau receives many inquiries regarding the disposition of the fish which are reclaimed. "Why do you save those terrible carp and those repulsive catfish?" and many other like questions are asked.

The bureau considers carp eradication of the utmost importance. They have but small food value. They are a menace to other fish life. Carp live and thrive upon the roots and seeds of aquatic plants con-



FIG. 102. Planting rescued catfish in the San Joaquin River near Tracy. Photograph by E. S. Cheney, August, 1929.

taining the algea so necessary for food and the protection of young game fish after emerging from the egg stage. Carp also eat the spawn of other valuable game fishes. They are of no food value commensurate with the destruction they do. Consequently, this bureau is eliminating them from all waters where we operate.

The sucker is in the same class with the carp. He is neither fit for the table, nor considered good bait for game fish. Many tons of each species are destroyed and given to farmers for fertilizer, as these fish, if plowed under the soil, make good fertilizer. The one favorable feature!

"The repulsive catfish." This plebian of the finny tribe, the lowly but delicious cat, is not a native of California, but was intro-

duced into our waters in the year 1874. Similar conditions existed here as in the Mississippi Valley, from whence he came, and he thrived not wisely but too well for his own being.

To the people who did not know him and the delicacy of his flesh he was too cheap to be good and too ugly to be useful. The people in the states from whence he came appreciated the food value, so the California dealers shipped him by the ton to a ready market. However, very few, if any, are exported today. Our people now appreciate him and the selling price is from 20 to 30 cents per pound.

Since this bureau was created, August, 1928, nearly one and a quarter million of these fish have been reclaimed and moved to permanent waters.

HORSEHAIR SCARCE FOR BIRD NESTS

The automobile and tractor are causing Nature to revise her scheme and adopt modern methods; the horsepower under the hood is making birds use string now instead of horsehair in building their nests.

The crowding out of the horse by motor vehicles has created a scarcity of horsehair, a necessary material in the building of many birds' nests. Birds that weave their nests and formerly tied the structure together with horsehair, are now resorting to string in the absence of the old standby.

This is but a material illustration of the many changes that are being forced in Nature by modernity. In order to offset the changing conditions, science, sportsmen, and others have joined hands to conserve the remaining wild life and to devise ways to assist Nature to restore it to its former abundance. Several fundamentals have been arrived at as a basis. The principal ones are the necessity of providing sufficient and year around natural food supplies for the various species; winter feeding in snow areas; sufficient cover for species to rest, nest and hide from their natural enemies; the control of their enemies, and the prevention and cure of epidemic diseases that visit certain species.—American Game Protective Association.

DON'T BE A CARELESS HUNTER

Hundreds of persons are killed and wounded every year through careless acts in hunting. Most of these accidents are unnecessary and can be avoided by applying common sense in the handling of firearms. Here are a few rules that are well worth reserving for application:

Don't keep your gun loaded except when you are actually hunting but handle it at all times as if it were loaded.

Don't point your gun at any one even if you are sure it is empty.

Don't handle a gun by the muzzle or pull it toward you.

Don't carry your gun when climbing fences or brush piles.

Don't carry your gun so that an accidental discharge might shoot your companion.

Don't shoot at any game unless you can see it clearly enough to positively identify it.

Don't be the fool who "didn't know it was loaded."

ARCHERY AND THREE-SHOT GUNS

A bill to legalize hunting with bow and arrow in New Hampshire, and another to prohibit the use of automatic and pump guns of more than three shots in Alabama, are reflections of a new trend of the times among sportsmen.

A growing percentage of hunters want to make their sport more difficult, not less so, the report said. They want to give their quarry a sporting chance, and at the same time extend their own skill to the utmost.

The perfection of ultra-modern contrivances for reaching hunting areas and taking game, combined with the dwindling of wild life under the handicaps of civilization, are resulting in a "back to nature" movement in the hunting world.

In order to escape the "mechanical age" during their vacations, more and more men are deliberately seeking primitive methods of traveling and hunting while in the woods.

There seems to be a clamor for legalized long-bow hunting by the archery enthusiasts in several states as an extreme evidence of this reaction in the out-of-doors.

Firearm manufacturers have already recognized the trend, the report said. One company has recently produced a three-shell shotgun to replace those of five and more shots, another has brought out an improved double barreled gun, and others have similar shotguns in the making.

They are fully alive to the situation and are anxious to do their share toward maintaining the game supply.

MENU OF 1890

Here are a few delectable items of a repast served by the Grand Pacific Hotel of Chicago back in 1890—at a cost of $12 a plate, exclusive of wines. They were typical of feasts no longer seen in American restaurants because of the scarcity of game and protective laws against market hunting.

Roast—Black-tailed deer, saddle of antelope, mountain sheep, loin of venison, loin of elk, black bear, wild goose, sandhill crane, ruffed grouse, mallard duck, partridge, wood duck, sage hen, prairie chicken, wild turkey, quail, snipe, plover.

Broiled—Venison steak, gray squirrel, blackbirds, red-winged starling, reed birds, rice birds, marsh birds.

Entrees—Venison cutlets, mushroom sauce; breast of prairie chicken, truffles; rabbit, larded, champagne sauce; squirrel pie, hunter style.

Ornamental Dishes—Galantine of wild turkey, boned quail in plumage, pyramid of game in jelly, boned duck au naturel, birds at rest, prairie chicken en socle.

Of the game listed none can be hunted today out of restricted seasons, several species are on the brink of extinction, others are protected the year 'round.

Farmers and landowners are now being encouraged to raise game as a secondary crop. Almost every state is stocking wild life refuges and establishing public hunting areas. Game can be expected to return

in sufficient abundance to garnish the boards of the sportsmen and their families.

CONSERVATION BODY MAY DISBAND

After achieving only the first step toward its goal, the Quetico-Superior International Council, which for six years has striven to bring about a treaty between Canada and the United States protecting for all time the largest wilderness area east of the Rocky Mountains, may soon be forced to disband by lack of money, according to Ernest C. Oberholtzer, president and secretary.

Numerous connecting lakes of the wild area form the boundary line between Ontario and Minnesota. The territory on the American side alone is as large as the state of Connecticut. Part of this tract is already included in the Superior National Forest, while on the Canadian side a portion forms the Quetico Provincial Park.

The Canadian-American group gathered six years ago to combat the plans of power interests to build dams which would affect thousands of miles of shore lines, drown out islands and obliterate rapids, waterfalls and beaches.

The council succeeded in obtaining the passage of the Shipstead-Nolan bill by the 1930 Congress, providing that the water levels and the shore scenery shall not be changed except by Congress' permission. The act was mainly to avoid the immediate danger threatening the beauty and recreational value of the wilderness.

The group has continued to work for a permanent program of administration between the two countries, claiming that if either allowed tampering with its own lakes the other would suffer.

TRYING TO SAVE THE EVERGLADES

Creation of something unique in American national parks—a strange tropical area of 2000 square miles and much of it impenetrable except by boat and airplane—failed to materialize in the recent Congress, but the long fight to preserve the region is going ahead, according to officials of the American Game Association.

This is the famous but seldom visited Everglades of Florida. It is the scene of the last stand of egrets, ibises and other tropical water birds, and the home of the crocodile and nearly extinct manatee.

The creation here of a national park will probably be the only permanent means of saving the wild life of the everglades. This wilderness is the haunt of solitary fishermen, and the retreat of hiding outlaws. The eight Federal wardens, financed by the National Audubon Society, have not been able to stop the smuggling of ibises for food and of aigrettes, the egrets' love plumes.

Making the rare species of economic value as attractions to tourists who like the unusual, instead of leaving their protection to almost pure sentiment as at present, may turn the balance between life and death.

Dr. T. Gilbert Pearson, president of the National Audubon Society, for many years has led the fight to save the birds of the Everglades, even living among the fishermen for long periods to obtain data on smuggling operations. He describes the proposed park area as a wilderness of exotic tropical beauty, largely savannas, small hammocks or islands and marshes, where mangrove stands often tower 100 feet high.

CONDITIONS IN SOUTH

After an extensive field tour in his district, Deputy E. H. Ober gathered some very interesting information. Here are a few of the facts:

February has been the most open month for fine weather conditions in this section for many years. The mountain regions have had very light snows. Coyote Valley can now be reached by saddle horse with no snow to cross. Elevation at the real top of the valley is over ten thousand feet.

The various and numerous streams, including Owens River and West and East Walker Rivers, have held up exceptionally well, owing to the early warm weather.

Trout are now beginning to run up stream from Topaz Lake into West Walker River, making this the very earliest run for the past 25 years.

Deer have wintered in the lower foothills all along the eastern slope of the Sierra. Very few crossed this year to the White Mountains.

Owing to the drying up of many ranches in the Owens Valley, the valley quail are taking to the Sierra foothills. Pheasants are quite plentiful in the upper sections of Owens Valley and those recently liberated in Antelope Valley, Mono County, are holding their own as good protection is being given by the ranchers.

NATURE GUARDIANS

The organizations of the above name is made up of Ohio children of school age. By signing a pledge card to protect wild life and to uphold game laws, each member is presented with a certificate of membership, a cardinal lapel button and "course of study" pamphlets, that teach elementary things about wild life and nature. It's all free. The membership is expected to reach 100,000 this year. Individuals may secure material direct or teachers may present the matter and enlist whole schools. The movement is intended to interest children in the out-of-doors, and inculcate understanding and observance of game, lake and park laws. Particulars may be had from the Conservation Division, Bureau of Education, Columbus.—*Du Pont Game Conservation News,* March, 1931.

VETERINARY FIELD NEEDS MORE TRAINED WORKERS

"At least one type of professional man, the veterinarian, is not finding his field overcrowed today," in the opinion of Dr. J. R. Mohler, Chief of the Bureau of Animal Industry, United States Department of Agriculture, expressed at the Twenty-third Annual Conference for Veterinarians at Ithaca, New York. "At no time in our history," the speaker said, "have there been such pressing demands for veterinarians who have received advanced training in research and experimental work."

One of the most promising opportunities for the veterinarian is in the field of parasitology. Parasites, he pointed out, are present in most animals almost everywhere and at all times. Thus the veterinary para-

sitologist has a broad field when he treats only our common domestic animals and fowls, but his future field will be very much broader than this, Doctor Mohler believes.

In this connection Doctor Mohler said: "Game conservationists, also State and Federal agencies, are opening up lines of attack on problems of parasitic infestation among game birds and mammals. Among the problems of evident importance are those involving the control of such parasitic conditions as coccidiosis, scabies, tick infestations, lungworm disease, gapeworm disease, and helminth infestations of various sorts. Thus far no measures have been evolved to prevent the spread of parasites from one state to another by shipments of game and game birds which endanger domesticated animals as well as other game animals. The interrelationships of disease and parasites of domesticated and wild animals require investigation. Fur farming is constantly adding to the list of semidomesticated animals which will be the veterinarians' patients in the future. Comparatively little is known of the parasites of fish." Thus the field of the future well-qualified veterinary parasitologist offers almost limitless possibilities.—*Du Pont Game Conservation News,* March, 1931.

BIRD'S NEST FOUND IN SKIN OF HARE

A German hunter reports a find that almost matches the Biblical story of Sampson discovering a colony of bees in the carcass of a lion. In the dried-up remains of a hare wedged in the branches of a fir tree he found the nest of a bird containing a full complement of eggs. The hare had probably been picked up dead by an earlier hunter, hung up in the tree and then forgotten.

What should have prompted the bird to select this utterly unusual and somewhat gruesome nesting site is a puzzle to naturalists.—*Science News Letter,* March 7, 1931.

FISH SHOOTS INSECT WITH DROP OF WATER

A fish that shoots its insect prey with a drop of water is among the ichthyological incredibilities definitely assured as scientific facts by Dr. Hugh M. Smith, former United States Fish Commissioner, who recently returned to Washington from Bangkok, where he is adviser in fisheries to the Siamese Government. So accurately can the little fish hurl its liquid projectile that on at least two occasions Dr. Smith has seen lighted cigarettes extinguished in the mouths of smokers on a veranda a couple of yards above the surface of the pond where the fish were swimming.

When the shooting fish sights an insect that it considers a likely candidate for dinner, it quickly pokes its eyes and the tip of its snout above water, holding its body at an angle of about forty-five degrees. It opens its wide mouth just the slightest crack in the middle, like a veteran terbakker-chawer from the Ozarks, and at the same instant suddenly squeezes its gill-covers. The speeding drop of water that shoots forth seldom fails to bring down its mark. Dr. Smith states that he has even seen these fish dislodge small lizards with these water bullets.

The range of the shooting fish's projectiles has not yet been accurately determined. Dr. Smith says that he has seen the fish make

good scores at a distance of a yard, and has known of cases where the projected drops spattered against the ceilings of verandas three or four times that high. He has a number of these fish in a pond in his yard in Bangkok, on which he expects to make further observations. They are sociable fish, he says, and like the attention of human beings.—*Science News Letter,* March 7, 1931.

AMERICAN GAME MAMMALS AND BIRDS

The latest contribution of Dr. John C. Phillips to the world of "sport, natural history and conservation" comes to us in the form of a catalogue of books on those subjects, entitled "American Game Mammals and Birds," covering the period of 1582–1925. This book, "A Bibliography of American Game" is divided into three parts, part one, a general catalogue including "a list of works or separates dealing in whole or in part with the subject of North American game mammals, fur mammals, upland game, wildfowl and shorebirds ranging from the Canadian Arctic to Central America and Panama, up to and including the year 1925," part two covering general, federal and state conservation, as well as conservation in Canada, and part three, a list of periodical publications, pamphlets, etc.

Dr. Phillips, president of the American Wild Fowlers League, member of the National Committee on Wild Life Legislation, president of the Massachusetts Fish and Game Protective Association and member of other national and local organizations interested in conservation, is an authority of international repute on these subjects.

His work "A Natural History of the Ducks," in four volumes is recognized as an authoritative treatise on ducks, not only of the Americas, but of the old world as well. Some of his other works are: "Boy Journals," "Wenham Lake Shooting Record and the Farm Bag," "A Sportsman's Scrapbook," and "Shooting Stands of Eastern Massachusetts."

This new bibliography, we feel, will be invaluable to workers in conservation throughout the country.

LIFE HISTORY NOTES

DISEASES REDUCING TREE SQUIRREL POPULATION IN SOUTHERN CALIFORNIA

Numerous rumors and advices recently received by the Bureau of Education and Research of the Division of Fish and Game during the first three or four months of this year indicate that tree squirrels (*Sciurus griseus anthonyi*) were dying in numbers in Los Angeles and Santa Barbara counties. Accordingly the Bureau's pathologist, Dr. M. Hobmaier, was sent to investigate these reports, which he states are the result of the disease coccidiosis and the presence of mites. Dr. Hobmaier states that control of coccidiosis is not yet possible, inasmuch as the cycle of this disease is not yet thoroughly understood. It would

be necessary to make careful scientific investigations of the disease and ascertain the medium carrying it to the squirrels. Dr. Hobmaier suggests that a feasible plan for the study of this disease would be the creation of a farm for tree squirrels where they could be held and their diseases observed.—James Moffitt, 510 Russ Building, San Francisco, California.

SPORT FISHING IN SOUTHERN CALIFORNIA

For anyone interested in the study of fishes, a day spent on one of the fishing barges anchored in Santa Monica bay would be worth while. Dozens of would-be fishermen resort to the several barges every clear, calm day. The barges are the hulls of dismantled sailing vessels.

The variety of animal life brought to the surface by the fishermen is amazing. About a dozen species of fish form the bulk of the catch, but many other kinds are caught in smaller numbers. Some species appear at certain seasons, but most of them are resident in the bay throughout the year. The writer spent five or six hours on one of the barges on March 22, 1931, and made a list of the fish that the hundred or so anglers caught.

The mackerel is depended upon for the largest amount of sport, but they were not very plentiful that day. Nearly everybody, however, caught two or three large ones.

Tiny sand dabs were very much in evidence in the catch of the bottom fishes. Most of them were less than five inches long.

On the bottom with the sand dabs were numbers of baby rockfish which were caught two, three or even four at a time by those who were not too proud to be seen with 5 and 6-inch fish.

Swimming all about the barge were schools of small jack smelt and bay smelt. Some were caught for bait in a large lift net.

Several kingfish were brought up from the bottom. The fishermen look with scorn upon this fish because it puts up no fight and is not very good as a food fish.

A number of sablefish were caught on the bottom. This fish is not very common so far south, but about a dozen were landed that day. The sablefish is erroneously called "black cod" by many fishermen.

Two or three California halibut, a highly prized fish, were brought aboard. The halibut caught off the barges are all too often very small, but one of these was fairly large—about six pounds.

A few gamey bonitos were unfortunate in striking a baited hook and went to swell the catches of some anglers.

One halfmoon was landed after a stout fight. This handsome fish is one of the many California fishes that is called "blue perch" by those who are not familiar with the proper nomenclature of the fish.

A 5-foot soupfin shark blundered into a line and was hauled aboard amidst great excitement. Several species of sharks frequent the waters about the barges and very often individuals of one species or another mistake a bait for a piece of refuse thrown overboard.

One fish, the like of which had never been seen by anyone aboard, was caught on a sand dab line. It was a beautifully colored little thing about eight inches long. The most noticable feature was the high dorsal fin, the first two rays of which were produced into long filaments.

The fish is reputed to be rare so far south, although moderately numerous near San Francisco. It was identified as *Zaniolepis latipinnis,* a representative of the family *Hexagrammidae.*

In striking contrast to the handsome fishes mentioned above was the repulsive hagfish that fastened itself to a bait and was hauled aboard. This primitive creature is a slimy, gray, eel-shaped animal that has a rasping sucker mouth. It is a somewhat lower form than the bony fishes or sharks. It clings to fish with its mouth and tears their flesh away from the bones. It is very abundant in Monterey bay but is seldom encountered in Santa Monica bay.

In addition to the fishes, a number of other sea animals were caught. A large sheep crab waving its long, spiny legs presented its captor with a problem in hook extraction. Several red crabs of assorted sizes refused to release the baits they had seized and were brought aboard. One fisherman using a baited hoop net caught a sackful of the delicious crustaceans. The honor of causing the biggest sensation, especially among the women fishermen, went to the small octopus that seized a baited hook. The octopus (*Octopus bimaculatus*) is fairly common in the bay and is a frequent capture.

The list of fishes caught on the barge follows:

Bonito	*Sarda chiliensis*
Hagfish	*Polistotrema stouti*
Halfmoon	*Medialuna californiensis*
California halibut	*Paralichthys californicus*
Kingfish	*Genyonemus lineatus*
Pacific Mackerel	*Pneumatophorus japonicus dicgo*
Striped rockfish	*Sebastodes elongatus*
Sablefish	*Anoplopoma fimbria*
Sand dab	*Orthopsetta sordida*
Soupfin shark	*Galeorhinus zyopterus*
Bay smelt	*Atherinops affinis*
Jack smelt	*Atherinopsis californiensis*
Longfin greenling	*Zaniolepis latipinnis*

Richard S. Crocker,
California State Fisheries Laboratory, March 31, 1931.

LION—FROM FOREST TO TABLE

Is mountain lion meat suitable for the table? This question is often asked by the zealous nature advocate and the answer is an emphatic, yes! Indeed it is a palatable food and an unknowing person could easily be tricked into eating a lion steak.

While hunting lions with Jay C. Bruce, State lion hunter, last October we bagged a female on a State game refuge near Silver Creek. The party consisted of Bruce, Dr. Oscar Bailey, of Oakland, and the writer. We had with us five dogs, specially trained for mountain lion hunting.

Bruce sighted the tracks early in the morning along the Big Bend Road. He freed three of the hounds and took two dogs along on the leash. We trailed the lion until noon when the huge cat sought refuge in a tall pine tree.

The animal poised itself on a limb about fifty feet above ground and remained motionless. It made no sound, did not lash its tail and seemed satisfied with watching us savagely with its grey-green eyes.

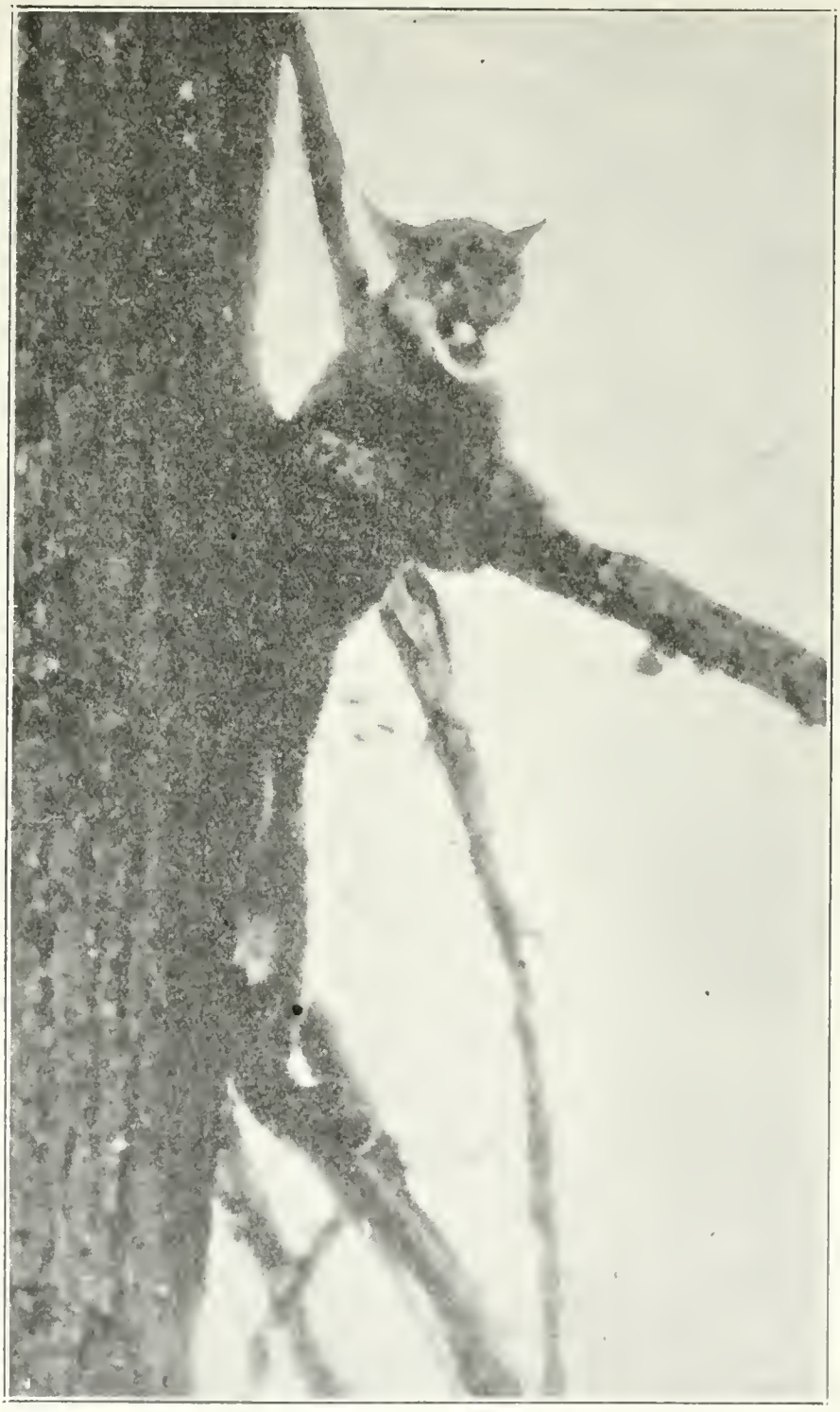


FIG. 103. Mountain lion poised on limbs and ready for action. Photograph submitted by Bert Higgins, Weaverville.

Dr. Bailey desired to make the kill so he was instructed by Bruce in regard to vital points in the lion's makeup. Standing beneath our quarry, he aimed at a point near the center of the body and slightly in back of the front legs.

He pulled the trigger. There was a deafening roar. The lion jumped, half whirled and headed at the spot where the three of us were standing. Mr. Bailey and I fell backward into some brush and Bruce, who was directly beneath the dying beast, escaped by some uncanny skill—he was not in the least disturbed by the experience but took it as a matter of course.

After landing, the lion bounded over a five-foot log before collapsing. Her weight was estimated between 90 and 100 pounds. She appeared to be in excellent condition.

Bruce removed the hide from the animal and then it was decided to hold a post-mortem. Examination showed that the bullet pierced a section of the heart, practically demolished the lungs and tore a gaping hole through the upper part of the body; this proved that the last heroic action of the animal was made of grit and courage alone.

We found the stomach gorged with deer meat thus proving that a fresh kill had just been made. A long tapeworm was also discovered and while this probably would not prove fatal to the animal it could lead to other vital complications during a poor food season.

The hams were removed to be used for dog feed. The meat appeared to have such excellent texture and firmness that the question arose as to its palatability. Bruce gave assurance that it made excellent food and said that many mountaineers would trade good beef for it.

Dr. Bailey and I decided to try a mountain lion steak. By 5 o'clock that afternoon we had two fine large steaks in the frying pan and were surprised how nicely the meat browned. The odor was exceedingly appetizing. It resembles fine, tender veal.

It is not exaggerating to say that the flavor was delicious. There was this drawback, however, the meat had not been allowed to hang a proper time and therefore was very tough. Despite that shortcoming we both finished our large steaks with a relish, and this despite the fact that Bruce, in jest, constantly reminded us that we were eating plain, unadulterated cat.—Earl Soto, 510 Russ Building, San Francisco, California, March 27, 1931.

WHITE-TAILED DEER IN CALIFORNIA

The supposed extension of white-tailed deer (*Odocoileus virginianus macrourus*) range in California is brought out by a photograph of a deer of that species killed by a gentleman from San Jose, a short distance south and west of the town of Topaz, in Mono County, California, during the latter part of the last deer season. From the photograph it appears to be a typical four-point buck of that species.

If any more of this species is secured anywhere in California, during the 1931 season, it is suggested that the skin, skull and horns be sent to the Museum of Vertebrate Zoology, University of California, Berkeley, California, for they are greatly in need of such a specimen.—D. D. McLean, 510 Russ Building, San Francisco, California.

DIVISION ACTIVITIES

BUREAU OF FISH CULTURE

A careful study indicates that all the streams and many of the lakes will be lower than ever before in the State's written history. Many authorities predict that the water will be as low as during the season of 1924. This is true to the extent that 1924 was approximately the eighth year of the protracted drought in California. Many fail to realize that we have been experiencing seven years longer of drought up to the present season of 1931.

Underground strata of water reserves which took centuries to fill, have been gradually diminishing. The water table is getting lower each season in the great central basins of California. In many areas water is being pumped at depths that have just about reached their limit.

In the foothill regions where the basal slopes are toward the central valleys, the water levels are dropping rapidly, as the stratas are drained not only by the run-off from the spring, but from the receding water table.

The fish this season should only be planted in the larger lakes and in the streams where the water flow will be sure to hold out until the fall rains, that we hope come again as in seasons past.

In some of the coast streams unusual numbers of steelhead trout were seen during the last two seasons. This was brought about by the fact that there was no other stream nearby where the fish could enter, and consequently they entered the first stream of good water. The fishing is improving in Lake Tahoe. Better fishing has been had since the opening date this season than for several years past. Fishing will continue good until the warm weather during July and August, when the summer turnover of plankton takes place and the fish descend to deep water. This condition has always prevailed in Lake Tahoe.

Twenty-five per cent of all eggs collected in this State, and in some seasons more, are produced from the Mount Shasta Hatchery ponds. The eggs from our ponds are always free from disease. The brood stock, particularly the Loch Leven and brown trout, have not degenerated in 35 years. The stock is now resistant to nearly all forms of pathogenic bacteria and other infections. This is the result to eleven generations of fish that have been kept free of disease and kept in proper conditions.

BUREAU OF FINANCE

Hunting licenses for the year ending December 31, 1930, totaled $464,157 as compared to $488,114 during the year 1929; this shows a decrease of $23,957. Trapping licenses also showed a loss and the total sale for the year was $2,860 as against $4,438 during the previous year.

As trout and black bass season opened on May 1, there was a very good sale of angling licenses during the last ten days of April. The

sales seemed to be comparable with the month of April, 1930, and if anything, there was a slight increase. This was due, no doubt, to the excellent fishing conditions that existed at this time.

Records show that the sale of angling licenses during the month of May continued in a very satisfactory manner. It is believed, although positive figures are not available at this time, that there is an actual increase in the sale of angling licenses up to the present time.

The estimated revenue for the 82d fiscal year was $1,421,210, so it is presumed that the income will show a decrease of about $55,000. This decrease is brought about principally by a falling off of the fish packer's tax of about $60,000 from the estimate, and fines of about $17,000 from the estimate. An increase in the income from license sales will offset a portion of the decrease of the two sources of revenue just mentioned, it is believed.

BUREAU OF GAME REFUGES

Water shortage this year has created some serious problems with our refuge work as well as hindering other conservation measures. Conditions on the Los Banos refuge are not entirely satisfactory because of the water. There is not enough flow in the San Joaquin River to take care of the needs of agriculture at the present time. The refuge will probably be short before the summer is ended. In order to reduce the present shortage a pump has been installed in Salmon Creek to put water into Olson Pond, on the refuge, and surrounding area in order that the water may be kept up during the waterfowl breeding season.

The transfer of the Gray Lodge property in Butte County to the Division as a part of the migratory waterfowl refuge system in the State took place during the month of April, 1931. This property consisting of 2541.51 acres is located about eleven miles southwest of Gridley and approximately the same distance northwest of Live Oak. It is practically on the northeast edge of the famous duck counties bordering on the west and north of the Marysville Buttes. The fact that during the past several years the ground has been used as a duck club, there has been an average annual harvest of more than 12,000 ducks, shows that it is excellently located. With the water rights obtained, water can be secured at practically all times and there should be no question as to having an excellent surface area of water throughout the year. There is now between 800 and 1000 acres of water surface.

D. D. McLean, field naturalist, has been studying refuge condition in various parts of the State and has obtained some very valuable information for conservation work.

Mountain lion bounty claims have been filed at the normal rate—between twenty and thirty per month. It is of interest to note that a female lion sent from Santa Clara county was killed within the city limits of San Jose. She was probably run out of the hills near Mount Hamilton by dogs, and was looking for a satisfactory den for her coming kittens.

Another fact of unusual interest was the killing of a mountain lion in Marin County on March 20. This animal, a male, was caught in a trap on the property of a country club near Olema. It was first reported by Frank Booth. Lion Hunter Bevans was asked to try

and locate the animal, but on account of the coldness of the trail and also on account of so many humans, the dogs were unable to follow. It was interesting to note that this lion was first reported seen by a relative of Mr. Booth's two years ago but the report was not taken seriously by anyone. From time to time horses in the club corral were injured by a supposed lion. No lion kills have been found anywhere in the locality. This is the first lion that has been submitted for bounty from Marin County since our commission began payment of bounty in 1907. According to Mr. Booth it has been 45 years since a lion was killed in that county.

BUREAU OF PATROL

Fish rescue equipment has been purchased for captains and deputies in the field and, because of the drought, it was necessary to start early activities along this line in various sections of the State. Thousands of fish will be rescued from drying ponds and streams and placed in live waters before the fall rains bring relief.

Two annual conventions were held during the spring months. One convention was the Sixth Annual Convention of the employees of the Division and was held in San Francisco on April 15, 16 and 17. All but three of the members of the patrol department attended this meeting and the absences were due to either sickness of individuals or in the employee's family.

The other convention was the Third Annual Convention of the Volunteer Deputies and was held in Los Angeles on May 23 and 24.

Thousands of anglers went into the field for the opening of the trout season and many arrests have been made for violations.

BUREAU OF EDUCATION AND RESEARCH

Very much important work is now being carried on in regard to the life history of our various game fish, birds and animals. The information gained will be invaluable in the future progress of our conservation work.

"Fawn tickets" have been given to all deputies and it is hoped to gain some excellent information relative to the breeding habits of our deer.

"Creel census" cards have also been prepared and it is hoped to gain some actual facts in regard to the size of fish caught by our anglers, as well as the number, and the place.

The return to date on these cards has been very satisfactory. The system, no doubt, is meeting with the approval of those who are interested in conservation work.

The work on the duck breeding grounds census has been started and is progressing without interruption. The findings of the census will be published in the October number of this publication.

Visual education work is becoming more and more popular and constant demands are coming from all sections of the State for pictures and lecturers. E. S. Cheney, photographer, has succeeded in obtaining some rare and excellent motion pictures of the sandhill crane. The nests of these birds have not been previously reported as located in California. Cheney also assembled an excellent two-reel motion picture

entitled "Here and There With the Camera." This picture has created much favorable comment wherever shown.

As deer damage in orchards started early this season very much work and study has already been done along this line. It was found in some localities that the rain showers that occurred at various times washed the deer repellent spray from the trees and vines.

E. L. Sumner, Jr., is accomplishing much in his study of predatory animals and their relation to game on the refuges.

Research work at the Hooper Foundation is progressing with Paul A. Shaw and Dr. M. Hobmaier handling the phases of the work. They have already discovered some very important steps in the fight against the diseases that attack our game.

Many new books and pamphlets have been added to the library shelves and an accurate inventory and card index system is being completed.

BUREAU OF HYDRAULICS

Inspection trips have been made throughout various sections of the State to study the numerous problems as they present themselves. In some cases where complaints on water pollution had been made we were able to correct the trouble through educational methods, and without resorting to legal measures.

The Union Oil Company operating at Avila has removed a number of pipes and in other ways taken precautions against the escape of oil at this place. This is a continuation of the improvements made on the sumpage system.

Accompanied by Federal Forestry Service officials and officers of the Pacific Gas and Electric Company, an inspection trip was made of the deer crossings and the fencing installed at points on the Salt Springs conduit in Amador County. This work is being done to keep deer out of a large conduit. It was learned that as far as the work had progressed that a very good job had been done and most of the crossings showed use by deer. Underpasses on the conduit also showed signs of use by deer and it is hoped that there will be no appreciable loss of deer when this conduit is placed in operation, which will be about the middle of the summer.

The *S.S. Helen Whittier* going on the rocks necessitated pumps working while tied at Pier 11 at San Francisco and some oil escaped. It was later taken to the Hunter's Point Dry Dock of the Bethlehem Company and this company contracted with the Western Ship Service Company to take care of the oil in the vessel so that when placed in dry dock no oil would escape. The work was followed out in very good manner.

The Western Pacific Railroad Company at West Oakland has installed sumps together with storage tanks to obviate the loss of oil into the estuary from washing of the engines and other operations. The installations made by the company should prevent further trouble at this point.

BUREAU OF GAME FARMS

A glance at the records of the past three years shows that the hatching season of 1931 is earlier by at least a week than any of the previous years. Usually we have heavy cold rains during the month of February which tends to hold back the egg production of the various

birds. However, this year there was but little rain in February and the weather perfect for health and vigor in breeding stock.

In order to carry out the expanded program of incubation and brooding it was necessary to increase the electric equipment at both farms.

In addition to the extra incubating and brooding equipment at both farms we have inaugurated a system of egg distribution that will result in many more birds being released during the season. In most cases this program is being worked out with the help of the wardens assisted by interested individuals.

Most of the birds were laying during the month of April and the lay from ring-necked pheasants and valley quail was quite satisfactory. A total of 17,288 ring-necked eggs were laid, and the valley quail produced 1393 eggs. As a rule valley quail start laying later than ring-necked pheasants.

All of the quail eggs were incubated and brooded at our own plants, but in the case of the ring-necked pheasant eggs the surplus lay was shipped to clubs and reliable individuals.

According to letters received our program of egg distribution is meeting with approval on all sides and we believe the total bird production for the season will be greatly increased. As the eggs go out instructions go with them on setting, hatching and feeding the young birds. Last year we started this work and the check up showed that over 800 birds were raised for stocking purposes.

General conditions during the month of May were favorable to all phases of game farming. The moderately cool weather caused the breeding stock to lay well, and the rainless days were conducive to young stock growth.

BUREAU OF COMMERCIAL FISHERIES

The patrol boat *Bluefin* left San Pedro on March 30, for a trip of approximately fifteen days into Mexican waters to determine the extent of the area in which sardines spawn along the coast of Lower California. Data on the spawning of the mackerel were expected to be gathered and collections of the young of both mackerel and sardines were to be used at different points along the coast. The expedition had permits from the Mexican government to facilitate their entering and leaving ports in Mexico. The investigators on the trip included E. C. Scofield and H. C. Godsil, to do the research work on sardines; D. H. Fry, Jr., who is working on mackerel, and J. H. Wales, ichthyologist from the Hopkins Marine Station, who is making a study of rockfish on the coast. A radio set was installed on the boat for this trip, and the necessary license was secured and operator employed. Daily messages were exchanged and weather reports were learned.

This expedition returned to San Diego on April 16 with the news that they had traveled as far as La Paz. Although a detailed report is in the process of formation, enough information has been received to convince that the expedition was a very successful one and has yielded much scientific fact on the young stages of the sardine. It was determined that sardines spawn in considerable abundance 300 miles south of San Diego, and south of that in scattered numbers as far as Cape San Lucas. At Turtle Bay and Magdalena Bay they found young

sardines of the year were about two inches in length. Sardines of the year at San Diego do not reach that size until July. This find is a very important one, as Godsil in his work on the young sardines at San Diego found that in the late summer there is an influx of young sardines which average larger than the sardines of the year spawned locally. It was Godsil's theory, supported by some facts, that both groups of young were spawned the same year, and that the larger group was spawned some place down the Mexican coast and migrated to the north.

This finding of an earlier spawning down the Mexican coast will probably clear up the uncertainty existing as to the rate of growth during the first year—a very important point if we are to know in what year a dominant size group originates—and will throw considerable light on the migrations of the young.

The *Bluefin* continued her cruise to the north, as far as Eureka, to determine the extent of the maximum spawning area and to determine also the comparative abundance of eggs and larvae, with the idea of predicting future abundance.

In regard to salmon, the United States Supreme Court on April 30, 1931, dismissed the appeal of Charles F. Noack and others against the Fish and Game Commission and thus upheld a decision of the United States District Court which heard the case in San Francisco. The fishermen contended that the law preventing the possession of salmon within the State of California which were caught outside the three-mile limit, was unconstitutional in that it denies them equal privileges and assures admiralty jurisdiction. The decision finally settles the point that the State can give protection to the salmon by closed seasons in the outside trolling districts and, by closing the season to possession, can thus protect the salmon beyond the three-mile limit.

Salmon trolling was carried on during the month of April in Monterey Bay, under the new urgency measure. The fishermen received 11 cents per pound, but very few fish were caught. The fish were also scarce in May. These fish were more abundant out of Eureka and Fort Bragg, but the low price of 8 cents paid the fishermen in that district is resulting in decreased catches.

During the past spring the striped bass were so plentiful that the wholesale dealers placed limits on the amount they would receive from each fisherman. The striped bass catch for the first three months of the year amounted to 393,962 pounds as against 197,185 last year.

A hasty review of activities at the State Fisheries Laboratory at Terminal Island includes conferences on the sardine work of G. H. Clark and J. B. Phillips; work on the life history of mackerel by D. H. Fry, Jr.; publication of mackerel fishery by R. S. Crocker; analysis of the boat catches of yellowtail by S. S. Whitehead; L. A. Walford's report on the life history of the barracuda; mackerel bibliography by Mrs. G. C. Wheeler; teachers' bulletin, grammar and high school, on fishery "projects," and numerous work.

BUREAU OF FISH RESCUE AND RECLAMATION

Because of the drought, this bureau laid its plans early for an unusually busy season. Equipment was purchased and distributed to deputies in key positions in order that as many fish as possible may be rescued from streams, reservoirs and lakes which will dry up during the season. This phase of our work is of unusual importance this year.

Owing to the extreme low water conditions in all parts of the State, particularly in the delta region, the bureau is taxed to the limit to save the stranded fish. Lakes, canals, sloughs and other bodies of water that have never been known to be dry will become arid this season.

More game fish were rescued during the month of May of this year than in the six months period from January 1, 1930, to June 30, the same year. Charts show that 1,538,320 were taken from drying waters and placed in live waters during the month of May.

During the first five days of June a total of 870,007 fish were rescued which also exceeds the number saved for any other period of the same time.

VOLUNTEER DEPUTIES

The Third Annual State-wide Volunteer Deputy Convention banquet and pistol shoot held at Los Angeles May 23 and 24, 1931, was well attended by volunteer deputies from many sections of the State, and proved to be a complete and unquestioned success from every point of view.

The convention was held in the Hotel Alexandria's assembly room, starting at 1.30 p.m., Captain R. E. Jeffries of the Los Angeles District presiding, and the program was carried out and completed on schedule time. The banquet, which was held in the main dining room of the Hotel Alexandria at 7.00 p.m., was attended by more than 225 volunteer deputies, their wives, invited guests and interested sportsmen, our good friend Albert Lindley, of Stockton, acting as toastmaster.

California is the only State to maintain, as an organized body of game wardens, men who volunteer their services for the protection of fish and game and the enforcement of the fish and game laws, and is the only State to hold annual State-wide conventions of such game wardens.

California is also the only State to provide that the appointment of men who volunteer their services as game wardens must be recommended and sponsored by bona fide fish and game protective associations or clubs, and that all volunteer game wardens must be bonded to the State for the faithful performance of their duties.

It is also the only State that maintains a volunteer deputy patrol department to coordinate with the regular patrol, and to establish a system and set of rules for the supervision and control of the activities of volunteer game wardens that are similar to those that apply to the regular patrol.

REPORTS

SEIZURES OF FISH AND GAME

January, February, March, 1931

FISH—	
Abalones	2,415
Barracuda, pounds	400
Bass—	
Black	14
Calico	2
Striped	10
Striped, pounds	95
Bluegill, pounds	10
Catfish, pounds	18
Clams	2,441
Cockels	40
Crabs	36
Lobsters	524
Lobster, traps	132
Mussels, pounds	1,130
Nets	1
Salmon	3
Salmon, pounds	1,800
Trout	40
Trout, pounds	1,877
Whiting	10
GAME—	
Deer	10
Deer meat, pounds	843
Deer hides and horns	6
Ducks	170
Geese	2
Mudhens	9
Nongame birds	43
Pheasant	5
Quail	4
Rabbits	17
Shore birds	5
Swan	2
Traps (Animal)	1

GAME CASES

January, February, March, 1931

Offense	Number of arrests	Fines imposed	Jail sentences (days)
Deer; closed season	68	$2,805 00	223
Ducks; selling of; overlimit	22	1,410 00	100
Dove; closed season	1	15 00	----------
Hunting License Act; violations of	60	1,035 00	29½
Geese; closed season	1	25 00	----------
Mudhens; closed season	1	25 00	----------
Night hunting	16	25 00	360
Nongame birds; killing of	25	410 00	----------
Nets; bird, illegal	4	125 00	----------
Pheasants; killing of	6	575 00	----------
Quail; closed season	7	400 00	5
Rabbits; closed season	7	100 00	12½
Shore birds; killing of	4	100 00	----------
Shooting in game refuge	6	50 00	50
Squirrel; gray; closed season	1	50 00	----------
Swan; closed season	2	75 00	----------
Shooting from auto and motor boat	5	85 00	----------
Trapping song birds	1	92 00	54
Trapping License Act; violations of	2	10 00	----------
Totals	239	$7,412 00	833½

FISH CASES

January, February, March, 1931

Offense	Number of arrests	Fines imposed	Jail sentences (days)
Angling License Act; violations of	33	$785 00	50
Abalones; undersize; closed season	122	2,360 00	508
Barracuda; small	2	40 00	
Bass—			
Black; closed season	6	125 00	
Calico; closed season	1	25 00	
Striped; small	6	135 00	
Catfish; selling of	2	50 00	
Clams; small; overlimit	124	2,492 50	146
Crabs; small	8	170 00	
Commercial Fishing License Act; violations of	22	120 00	
Fishing apparatus; illegal	12	482 00	21½
Lobsters; small	14	335 00	5
Mussels; overlimit	10	250 00	
Nets, Seines; illegal	24	1,410 00	20
Perch; closed season	5		
Pollution of streams	6	300 00	
Salmon; closed season	7	20 00	
Sardines; failure to take required pack	1	50 00	
Spearing Steelhead	6	75 00	
Trout; closed season	28	555 00	15
Totals	439	$9,779 50	765½

STATEMENT OF EXPENDITURES

For the Period July 1, 1930, to March 31, 1931, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Bureau of Administration:					
Executive	$4,500 00			$6 46	$4,506 46
Clerical and office	15,983 55	$777 71	$486 87	406 49	17,654 62
Printing		10,874 72			10,874 72
Automobiles		270 87	84 55	1,503 90	1,859 32
Traveling			2,118 61		2,118 61
Postage			3,218 70		3,218 70
Telephone and telegraph			2,928 58		2,928 58
Freight, cartage and express			1,566 12		1,566 12
Rent			11,002 91		11,002 91
Heat, light and power			27 44		27 44
Accident and death claims			5,934 13		5,934 13
Accounting pro rata	3,375 00				3,375 00
Legal	4,950 00		181 80	110 15	5,241 95
Publicity			13 00		13 00
Totals, Bureau of Administration	$28,808 55	$11,923 30	$27,562 71	$2,027 00	$70,321 56
Bureau of Education and Research:					
Chief and assistant	$7,425 00			$12 92	$7,437 92
Clerical and office	1,440 00	$253 36	$158 46	178 13	2,029 95
Traveling			5,053 21		5,053 21
Telephone and telegraph			19 63		19 63
Freight, cartage and express			14 90		14 90
Photographer	900 00		63 00	714 69	1,677 69
Librarian	1,372 90	25 23	111 82	194 24	1,704 19
Research	6,013 71	399 13	2 00		6,414 84
Publicity			366 83		366 83
Temporary help	790 00				790 00
Summer educational work	546 68				546 68
Totals, Bureau of Education and Research	$18,488 29	$677 72	$5,789 85	$1,099 98	$20,055 84
Bureau of Patrol and Law Enforcement:					
Chief and assistants	$8,055 00			$6 46	$8,061 46
Clerical and office	2,307 50	$315 21	$12 74	48 03	2,683 48
Automobiles		6,819 50	2,530 41	9,077 75	18,427 66
Traveling			94,438 47		94,438 47
Postage			513 00		513 00
Telephone and telegraph			1,501 61		1,501 61
Freight, cartage and express			50 46		50 46
Rent			572 57		572 57
Captains and deputies	155,488 28	1,067 36	188 37	88 39	156,832 40
Launches	1,530 00	1,101 07	691 29	165 90	3,488 26
Fish planting	1,532 02	409 23	124 50		2,065 75
Volunteer deputies	280 00				280 00
Premiums on bonds			2,263 55		2,263 55
Temporary help	405 50				405 50
Heat, light and power			15 99		15 99
Totals, Bureau of Patrol and Law Enforcement	$169,598 30	$9,712 37	$102,902 96	$9,386 53	$291,600 16
Bureau of Commercial Fisheries:					
Chief and Assistants	$9,045 00				$9,045 00
Clerical and office	6,831 67	$61 77	$86 25		6,979 69
Automobiles		574 01	249 74		823 75
Traveling			14,650 58		14,650 58
Postage			6 17		6 17
Telephone and telegraph			319 93		319 93
Freight, cartage and express			156 69		156 69
Rent			672 50		672 50
Heat, light and power			210 85		210 85
Research	7,153 87	59 56	17 90	$133 73	7,365 06
Inspectors	19,001 90				19,001 90
Captains and deputies	11,702 50	117 16	32 77		11,852 43
Launches	9,378 08	4,789 78	2,398 49	3,767 24	20,333 59
Laboratory	23,448 04	630 42	1,692 23	1,248 61	27,019 30
Blue printing			15 29		15 29
Fish tags		202 00			202 00
Salmon tagging			3 50		3 50
Botulism			11,250 00		11,250 00
Statistics	2,205 00	1,859 00			4,064 00
Publicity			1 05		1 05
Totals, Bureau of Commercial Fisheries	$88,766 06	$8,293 70	$31,763 94	$5,149 58	$133,973 28

STATEMENT OF EXPENDITURES—Continued

For the Period July 1, 1930, to March 31, 1931, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Bureau of Fish Culture:					
Chief and Assistants	$4,950 00		$4 00		$4,954 00
Clerical and office	2,997 58	$50 36	$14 68	$63 00	3,125 62
Automobiles		3,734 12	1,828 12	4,935 38	10,497 62
Traveling			8,829 44		8,829 44
Postage			93 10		93 10
Telephone and telegraph			844 98		844 98
Freight, cartage and express			1,439 74		1,439 74
Rent			1,562 61		1,562 61
Heat, light and power			571 28		571 28
Hatcheries	96,943 22	44,262 76	976 67	1,026 44	143,209 09
Hatcheries—additions and betterments				49,699 67	49,699 67
Special field investigations	9,278 00	160 28	32 62	20 00	9,490 90
Fish cars	2,479 84	297 17	592 17	3 95	3,573 13
Blue printing			4 20		4 20
Total, Bureau of Fish Culture	$116,648 64	$48,504 69	$16,793 61	$55,748 44	$237,695 38
Bureau of Hydraulics:					
Chief and assistants	$5,145 00		$2 70		$5,147 70
Clerical and office		$70 70	20 83		91 53
Automobiles		324 04	165 90	$1,077 50	1,567 44
Traveling			1,265 55		1,265 55
Telephone and telegraph			7 79		7 79
Blue printing			14 09		14 09
Cooperative research	2,250 00				2,250 00
Postage			1 00		1 00
Publicity			2 52		2 52
Totals, Bureau of Hydraulics	$7,395 00	$394 74	$1,480 38	$1,077 50	$10,347 62
Bureau of Game Propagation:					
Superintendents	$5,870 00				$5,870 00
Automobiles		$373 19	$182 79		555 98
Traveling			1,356 61		1,356 61
Postage			13 11		13 11
Telephone and telegraph			176 95		176 95
Freight, cartage and express			56 18		56 18
Heat, light and power			671 91		671 91
Maintenance		7,339 82	881 41	$4,730 43	12,951 68
Temporary help	2,875 64				2,875 64
Assistants	3,420 00				3,420 00
Purchase of game birds		3,963 93			3,963 93
Totals, Bureau of Game Propagation	$12,165 64	$11,676 94	$3,338 96	$4,730 43	$31,911 97
Bureau of Fish Rescue:					
Chief and assistants	$3,505 00	$17 25	$170 81		$3,693 06
Traveling			1,352 77		1,352 77
Rent			149 00		149 00
Temporary help	325 00				325 00
Totals, Bureau of Fish Rescue	$3,830 00	$17 25	$1,672 58		$5,519 83
Bureau of Game Refuge:					
Chief and assistants	$2,999 97				$2,999 97
Clerical and office	1,788 45	$1 00	$1 25		1,790 70
Automobiles		638 79	271 41	$1,136 32	2,046 52
Traveling			947 53		947 53
Postage			49		49
Freight, cartage and express			50		50
Lion hunters and trappers	7,027 00				7,027 00
Refuge posting	4,481 00	4 80			4,485 80
Predatory animal control			5,740 00		5,740 00
Refuge maintenance	1,326 55	1,201 70	672 82	697 46	3,898 53
Telephone and telegraph			85		85
Publicity			8 20		8 20
Totals, Bureau of Game Refuge	$17,622 97	$1,846 29	$7,643 05	$1,833 78	$28,946 09
License commissions					$48,363 10
Expenditures to pay claim of Fred F. Freitas, Chap. 403-29					10 00
Purchase lease and improvements of game refuges					133,417 00
Opening channel of Salinas River					2,472 98
Protecting the construction of the Russian River jetty					4,540 85
State Fair and other exhibits					4,481 00
Prior year expense—81st fiscal year only					$2,813 68
Prior year expense—80th fiscal year only					400 37
Grand totals, Proprietary Group					$1,033,242 37

STATEMENT OF INCOME

For the Period July 1, 1930, to March 31, 1931, of the Eighty-second Fiscal Year

License sales	Detail	Total
Departmental income:		
Angling license, 1930	$429,202 50	
Commercial hunting club licenses, 1931	4,086 00	
Angling, 1929	450 00	
Commercial hunting club operators licenses, 1930-31	620 00	
Commercial hunting club licenses	2,110 00	
Deer tags, 1930	123,999 00	
Fish breeders' licenses, 1930	25 00	
Fish breeders' licenses, 1931	385 00	
Fish importers' licenses, 1930	10 00	
Fish importers' licenses, 1931	75 00	
Game breeders' licenses, 1930	142 50	
Game breeders' licenses, 1931	690 00	
Hunting licenses, 1929	100 00	
Hunting licenses, 1930	438,477 70	
Hunting licenses, 1931	8,139 00	
Kelp licenses, 1931	10 00	
Market fishermen's licenses, 1930-31	28,870 00	
Market fishermen's licenses, 1931-32	170 00	
Trapping licenses, 1930-31	2,860 00	
Wholesale fish packers' and shell fish dealers' licenses, 1930-31	1,120 00	
Wholesale fish packers' and shell fish dealers' licenses, 1929-30	5 00	
Total license sales		$1,041,546 70
Other income:		
Court fines	$57,017 93	
Fish packers' tax	89,833 76	
Fish tag sales	2,193 37	
Game tag sales	93 75	
Interest on bank balances	4,673 27	
Kelp tax	106 67	
Miscellaneous sales	370 20	
Total other income		154,288 95
Total departmental income		$1,195,835 65
Income for the State University Fund:		
Kelp tax	$53 30	

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JANUARY, FEBRUARY AND MARCH, 1931

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Anchovies									30,954
Barracuda									2,390
Bonito									643
Carp				4,470	9,646	6,325			
Catfish		39,274		226	40,034	6,741			
Cultus Cod	151,804	3,989					101,203	6,194	32,504
Flounders	5,871	1,560		27		566	7,331		10
Grayfish	60	1,890					39,789	2,025	
Hake							405		
Halibut	24,015	1,645					414	207	6,233
Hardhead					21,845				
Herring	17,646		135,710			4,778	291,615		250
Kingfish							422	4,027	42,350
Mackerel						62		252	395,965
Mackerel—Horse									2,479
Mackerel—Spanish									
Mullet									
Perch	5,394	40	18,976			42	17,113		8,904
Pike				234	947	787			
Pompano									204
Rock Bass									
Rockfish	86,639	8,452				27	216,304	307,641	701,197
Sablefish	24,164	24,254					51,139	28,608	2,389
Salmon	3,468			13,533	17,001	8,996	6,120	25	
Sandabs	85,561	5,405					37,399	48,122	2,364
Sardines							11,312,116	2,250	55,989,427
Sculpin									
Sea Bass—Black									
Sea Bass—White									130
Shad				248	299	1,341	423		
Shad—Buck				6,888	1,949	17,082			
Shad—Roe				5,188	2,439	20,865			
Sheepshead									

Skates		135					44,452	5,265	2,112
Skipjack									
Smelt	17,098		12,305			564	63,673	5,341	22,267
Sole	1,522,231	26,782					349,468	411,874	34,152
Splittail					5,347				
Striped Bass			1,536	29,442	68,811	251,905	43,191		
Suckers					469				
Swordfish									
Tomcod	33						723		
Tuna—Bluefin									
Tuna—Yellowfin									
Turbot			195						
Whitebait	27,465	5,539	46				232		3
Whitefish									
Yellowtail									
Miscellaneous	1,905	130		6	43	406	1,956	812	460
Total fish	1,973,354	119,095	168,768	60,262	168,830	320,487	12,585,488	822,643	57,277,387
Crustaceans:									
Crabs	[1]31,488		[2]2,064				[4]700,200	[6]192	
Shrimps			110,511				233,536		1,616
Spiny Lobsters									
Mollusks:									
Abalones									281,225
Clams—Cockle			36,855						
Clams—Mixed	7,073						79		
Clams—Pismo								436	5,579
Clams—Softshell			23,308			4,595	947		
Cuttlefish		1,732					713	390	11,133
Mussels	1,250								
Oysters—Eastern			[3]61,393				[5]106,700		
Oysters—Native	2,757		6,127				13,486		
Squid									164,522
Miscellaneous:									
Terrapins		12							
Turtles									
Totals	2,015,922	120,839	409,026	60,262	168,830	325,082	13,641,149	823,661	57,741,462

All amounts shown in pounds unless otherwise specified. Skipjack and Albacore cleaned.

[1] 1,312 dozen.
[2] 86 dozen.
[3] 279,060 shell oysters.
[4] 29,175 dozen.
[5] 485,000 shell oysters.
[6] 8 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JANUARY, FEBRUARY AND MARCH, 1931—Continued

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into California via San Pedro	Fish from south of the International Boundary brought into California via San Diego	Total fish from south of the International Boundary brought into California
Anchovies		6,773			37,727			
Barracuda		57,146	39	34,691	94,266	307,955	34,859	342,814
Bonito		5,750	483	4,120	10,996	3,589	712	4,301
Carp		5,952			26,393			
Catfish					86,275			
Cultus Cod	124	2,760			298,578			
Flounders		990			16,355			
Grayfish	241	35,479	8,053	27,900	115,437			
Hake					405			
Halibut	80,118	183,584	17,301	57,431	370,948	27	6,520	6,547
Hardhead					21,845			
Herring	242			2,273	452,514			
Kingfish		91,758	1,291	641	140,489			
Mackerel	214	1,359,541	106,341	77,623	1,939,998			
Mackerel—Horse		22,420			24,899			
Mackerel—Spanish						13,285	4,611	17,896
Mullet			615	478	1,093		2,276	2,276
Perch	1,561	32,774	554	21	85,379			
Pike					1,968			
Pompano		879	32		1,115		283	283
Rock Bass	13,975	31,353	7,097	10,368	62,793	10,699	8,283	18,982
Rockfish	13,098	926,809	26,079	338,526	2,624,772	819	406	1,225
Sablefish		3,495	139		134,188			
Salmon					49,143			
Sandabs		2,115	446		181,412			
Sardines	726,610	59,724,306	335	20,768	127,775,812			
Sculpin		17,180	4,212	5,014	26,406		30	30
Sea Bass—Black	2,019	19,718	2,860	65,007	89,604	27,046	26,796	53,842
Sea Bass—White	14,815	30,483	1,490	10,029	56,947	783	9,975	10,758
Shad					2,311			
Shad—Buck					25,919			
Shad—Roe					28,492			
Sheepshead	1,510	56,223	347	10,342	68,422		1,185	1,185

Skates		9,291	2,035	1,572	64,862			
Skipjack						39,515	294,783	334,298
Smelt	7,132	114,926	8,372	5,351	257,029			
Sole	37,074	9,662	284	1,779	2,393,306			
Splittail					5,347			
Striped Bass					394,885			
Suckers					469			
Swordfish				415	415			
Tomcod					756			
Tuna—Bluefin						173,241		173,241
Tuna—Yellowfin						249,085	4,665,818	4,914,903
Turbot					195			
Whitebait					33,285			
Whitefish	10	52,964	1,618	59,612	114,204	165	1,432	1,597
Yellowtail		2,407	17	1,093	3,517	175,502	153,041	328,543
Miscellaneous	1,851	15,962	98		23,629	58,874	18,778	77,652
Total fish	900,594	62,822,700	190,138	735,054	138,144,800	1,060,585	5,229,788	6,290,373
Crustaceans:								
Crabs					[7]733,944			
Shrimps					345,663			
Spiny Lobsters	27,090	40,382	2,618	31,114	101,204	272	559,309	559,581
Mollusks:								
Abalones	2,561				283,786			
Clams—Cockle		10,710			47,565			
Clams—Mixed					7,152			
Clams—Pismo	15,705				21,720			
Clams—Softshell					28,850			
Cuttlefish		23	18		14,009			
Mussels					1,250			
Oysters—Eastern					[8]168,093			
Oysters—Native					22,370			
Squid		30,283			194,805			
Miscellaneous:								
Terrapins					12			
Turtles							2,726	2,726
Totals	945,950	62,904,098	192,774	766,168	140,115,223	1,060,857	5,791,823	6,852,680

[7] 30,581 dozen.
[8] 764,060 shell oysters.

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"CONSERVATION OF WILD LIFE THROUGH EDUCATION."

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FOOD HABITS AND ECONOMIC STATUS OF THE BREWER AND RED-WINGED BLACKBIRDS

By PABLO S. SORIANO

INTRODUCTION

FROM THE economic point of view, birds may be divided into three classes, which are: (1) birds that are destructive throughout their lives, for example, western goshawk and sharp-shinned hawk; (2) birds that feed on crops a part of the year and on insects

the rest of the year, for example, starling and meadowlark; (3) birds that are beneficial all of the time, for example, most hawks and owls.

The Brewer and red-winged blackbirds belong to the second class. Farmers whose crops are visited by flocks of these two kinds of birds complain greatly, and they are convinced that these birds are destructive. On the other hand, some orchardists and farmers whose orchards and crops have been saved from the attacks of insects by these birds feeding on them declare that they are beneficial. Both sides have good arguments to support their views. The question comes up—What is the real economic status of these birds, in the interests of everyone, beneficial or destructive? To answer this question it is desirable to investigate the yearly food of the birds, by means of examination of the stomach contents, and to find out the ratio of the destruction wrought to the benefit they do.

The materials that have been used in this work were collected by deputies of the California Fish and Game Commission and were prepared for long-time preservation by Dr. Harold C. Bryant when he was still connected with the Museum of Vertebrate Zoology, University of California, prior to 1916. The materials were thus already in the laboratory, ready to be worked upon, when this project was undertaken by the author in the summer of 1930. The work has been done in the Museum of Vertebrate Zoology under the guidance of Doctors Jean M. Linsdale and Joseph Grinnell.

GEOGRAPHICAL RANGES

Brewer Blackbird (Euphagus cyanocephalus)

Geographical range: Western North America; north to British Columbia, Alberta and Saskatchewan, in the Dominion of Canada; east to Manitoba, Minnesota, Nebraska, Kansas, Oklahoma, and Texas; south to Lower California, and in winter over the Mexican tablelands to Oaxaca. There are two subspecies.

Red-winged Blackbird (Agelaius phoeniceus)

Geographical range: Temperate North America; north in the eastern parts of the Dominion of Canada to Ontario, Nova Scotia and Quebec; in the interior to Mackenzie and Keewatin; and on the Pacific coast to southern British Columbia; south to Costa Rica, Central America. There are numerous subspecies.

DESCRIPTIONS

Brewer Blackbird

The Brewer blackbird is smaller than a robin. It is about $7\frac{3}{4}$ to $9\frac{3}{4}$ inches long. The male in summer is glossy greenish black with the neck purplish black. The female is one-fourth smaller. In summer it is brownish gray on the head, neck, and under parts of the body. Head and neck are faintly glossed. Wing and head are more glossed with bluish green. In winter it is paler. The first-winter male is more or less like the adult in color except that the tips of the feathers are grayish brown. Young birds of both sexes are like the female in color, but they are not glossy. The adult male is always distinguished from the female and young by its having a whitish eye; the female's

eye is brownish black. There is no stage in this species of blackbird when the plumage has streaks.

The Brewer blackbirds are common residents in foothills, lowlands, and plains, and they occur in smaller numbers in the mountains. They forage chiefly on open ground. They are tame and fearless in demeanor. A person can ordinarily approach them within a few yards.

When on the ground the birds walk with alternate tread and with a consequent side to side movement of the body, and fore and aft movement of the head. They walk easily and gracefully. They are restless creatures. As they continue moving they are looking for food. The birds in the rear, when in a flock, fly up and settle down just ahead of the foremost ones, and this is continued until, when they are all disturbed, the flock flies to a tree or to telephone wires nearby.

Red-winged Blackbird

The male red-winged blackbird is about the same size as the male Brewer blackbird. It is solidly black except for a brilliant red patch at the bend of each wing. The male in winter has the edges of the feathers on the back rusty. The female is decidedly smaller. The plumage of the female, especially in the nesting season, is harsh in comparison with the silky plumage of the male. The top of the head is dark brown with a buff stripe over the crown. The under surface is whitish, heavily streaked with dark brown. The color of young birds is like that of the adult female, the plumage being of heavily streaked pattern. This makes them easily distinguished from young Brewer blackbirds.

These birds are gregarious, most of the time. It is only in breeding season that they are not in flocks, but in pairs, although the pairs are usually in groups even at that season. Their favorite haunts are moist meadows, near streams, ponds, lakes, and marshes; also they often nest in rankly growing hayfields. They are not usually as tame as Brewer blackbirds. Red-winged blackbirds perch on the perpendicular, upright stalks of plants such as rushes along streams, around ponds, and in marshes.

Brief Life Histories of Brewer and Red-winged Blackbirds

The life histories of the Brewer and red-winged blackbirds are in major respects the same. The breeding season takes place in April and May. It is at this time of the year that these birds are in pairs. The courtship of the male Brewer blackbird is not so demonstrative as that of the red-winged blackbird. The nest is usually started within a week after mating and it takes the birds about a week to finish a nest.

The Brewer blackbirds never nest in large colonies. They usually build their nests in bushes or small trees at different heights from the ground, but sometimes also on the ground itself. The nests when placed in trees and bushes are quite bulky, consisting of platforms of coarse sticks supporting a deep cup composed of weed and grass stalks, shreds of bark, rootless dry grasses, mosses, and mud, the latter when dry serving as a binding cement. The nests built on the ground are well built and the materials used are mostly moist when gathered. The nest is generally about six inches in outer diameter, four inches in inner diameter, three inches in outer depth, and two and one-half inches in inner depth.

The red-winged blackbirds usually build their nests among the dense vegetation in marshes; sometimes the nests are in rank weed-patches or even in standing grain. The size of the nest is practically the same as of the nest of the Brewer blackbird. Mud, however, is not used by the red-wing. Sometimes red-winged blackbirds' nests are found in the forks of willow, alder or elder bushes. They nest in colonies.

The number of eggs that the Brewer blackbird lays is more, on an average, than that of the red-winged blackbird. The number of eggs in the former is usually five, while that of the red-winged blackbird is usually but three or four. Eggs are deposited daily until the set is completed. Incubation takes about two weeks.

The male Brewer blackbird is very helpful to his mate during breeding season. He helps in the construction of the nest, in the protection of the eggs, and in the protection and care of the young. Both male and female greatly protest at the approach of any animal to their nest and sometimes the neighbors help them in driving away the intruder (Grinnell and Storer, Animal Life in the Yosemite, 1924, p. 414). Incubation is done only by the female. The birds of a pair are usually seen walking side by side with swinging gait searching for food for themselves as well as for the young.

The male of the red-winged blaekbird, as a partner, is not as helpful as the male Brewer blackbird. He does not help much in the building of the nest or in feeding and caring for the young. This is due, perhaps, to his polygamous habits. However, he defends the nests and young in the colony of red-wings against any intruder. Yet in nest protection, the Brewer blackbird is the more aggressive.

In winter red-winged blaekbirds occur in great flocks. These birds, in parts of their general range, migrate twice a year—in the spring and in the fall. Spring migration usually takes place in March and April. At this time they are in flocks going to their breeding places, where they nest in April and May. In 16 days after hatching, the young birds leave the nests and join in flocks by themselves. In October and November they in company with the old birds migrate again to warmer places or to places where food is more plentiful. During the two migrations, when they are often in flocks of enormous numbers, is the time they do most damage to the crops. In both migrations the flights are usually made in the evening and early morning.

These two species of birds each have distinctive calls and notes. The song of the male Brewer blackbird is a wheezy *tseur* or *tshee*. Both the male and female utter a harsh *tshick* and this is uttered by them in flying, foraging or perching. The male red-winged blackbird gives a throaty *long-leur-lee*. Both sexes, adult or young, when excited give a sharp *chack*. The male whistles and scolds when an intruder approaches the nest.

BASIS FOR INFORMATION

A good and reliable basis for information as to the real economic status of birds is field observation supplemented by stomach examination (Bryant, Univ. Calif. Publ. Zool., **11**, 1914, p. 456). In field observation, it is easy to see the destruction or benefit the birds do in the

grain fields and orchards, especially when they are in great flocks, which is hard to tell in the examination of stomach contents. It is the vividness of the impression that sometimes counts. In field observation, it can be also observed whether they take newly sown seeds or uncovered grains, which can not be told in laboratory examination. In field observation it is sometimes more easy to identify the insects as well as the vegetable food eaten, for the items are still complete.

In this work field observation was not done, for the specimens that have been worked upon were already assembled. However, the result of stomach examination gives a fair indication of economic status, for whatever objects are found in the stomachs are definitely what the birds get in feeding.

METHOD USED IN ESTIMATING THE QUANTITY OF FOOD IN A BIRD'S STOMACH

There are three methods generally used in estimating the quantity of food in a bird's stomach. They are: (1) The articles found may be weighed; (2) they may be estimated by the volume; (3) they may be counted (Bryant, *op. cit.*, p. 440).

The weight method is more or less neglected because it is not practicable. Besides, the weight of vegetable food or animal food does not indicate the degree of injury or benefit that the bird gives.

The percentage by volume has been used in this work only in the estimation of the space the vegetable food or animal food or pebbles occupies in the stomach, for this shows the ratio which each bears to the others. The presence of one limits the presence of the others, depending upon the size. For example, the greater the volume of wheat the less the volume of animal matter or pebbles, taking for granted that the stomach is full.

The degree of injury or benefit that an animal does depends directly on the total number of injurious organisms that it destroys. Having this in mind the numerical method is advisable. This method has been followed in taking the percentage of the different kinds of foods taken in connection with this work.

The number is determined by counting. The number of the paired mandibles of grasshoppers showed the number of grasshoppers taken. The number of snouts of beetles showed the number of weevils taken. The number of paired elytra showed the number of beetles taken.

METHODS OF IDENTIFICATION

The stomach is opened lengthwise at the side and carefully cut so that the materials inside are not destroyed. The contents are put in a white basin with a little water in it, so that it is easy to separate the vegetable food from the animal food, as well as from the pebbles. After they are separated they are piled up—one pile for vegetable food, one pile for insect food, and one pile for pebbles; and the ratio of each volume to the others is taken. After the ratio is taken, which perhaps is not arithmetically exact, the different kinds of food are separated and each kind is counted and identified. The ratio and the number are recorded on a card as shown below. The number of items of each kind found and their condition are recorded under "contents."

No. ------ Date_____Time_____
Locality _____
Type of vegetation_____Collector_____
Name of species _____
Condition of stomach_____
Animal matter, no. of items_____Percentage____
Number of items of vegetable matter_____Percentage____
Number of pebbles_____Percentage____
Contents _____

To identify the kinds of food found in the stomach is a hard task. If the grains, seeds, or insects found in the stomach are not yet at all digested, to identify them is not so hard; but when they are partly digested, then it becomes difficult to identify them with certainty.

To facilitate the identification, recourse is had to a collection of insects, seeds, and grains with which to compare what has been found in the stomach. The insects, the seeds, and the grains are put in vials (one vial to each kind) and are dried out for identification. In some cases the insects are put in water, to float, so that external appendages can be made loose for examination.

The insect collection of the Entomology Department of the University of California, in the Agricultural Hall, and the seed collections made by Dr. H. C. Bryant were used for comparison in connection with this work. In the examinations a hand lens in addition to a binocular microscope was used.

THE GROUPING OF COUNTIES

All the counties where the 500 birds examined were taken are arranged in three groups. Each group includes those counties that are near to each other, and this means that the season of planting and harvesting is almost the same, as well as the vegetation and crops raised, within each group.

Group I includes the following counties:

1. Siskiyou
2. Humboldt
3. Mendocino
4. Tehama

Group II includes the following counties:

1. Sonoma
2. Sutter
3. Nevada
4. Calaveras
5. Alameda
6. San Joaquin
7. Stanislaus

Group III includes the following counties:

1. Fresno
2. Kern
3. Riverside
4. Ventura

FOOD HABITS OF THE BREWER BLACKBIRDS

Group I

The examination of the 125 stomachs of Brewer blackbirds showed that 38 per cent of the annual food was animal matter. It was more than 50 per cent of the food from February to July except in April when it was only 9 per cent. The maximum was taken in May, June, and July, the figures for which were 70, 100, and 81 per cent, respectively. In April, although the vegetable food was 91 per cent of the whole food, most of the items were weed seeds, which made up 75 per cent of the total content. Animal food was lowest in December, when it was only 3 per cent of the food.

Animal Food

Insects

Out of the animal food which numbered 1135 items only one was an arachnid. Practically all the animals taken were insects. The monthly food percentages are: January, 49; February, 61; March, 55; April, 9; May, 70; June, 100; July, 81; August, 16; September, 11; October, 44; November, 5; December, 3. (See table 1.)

In winter the percentage of insect food was low due to the fact that insects hibernate. The insects mostly taken were the ones found in their hibernating places, and the bodies of the dead ones that were preserved by the winter cold—but as early as February, insect food was already 61 per cent and most of the destructive insects were caterpillars, locusts and click beetles. These insects were the destructive ones, most liable to be the prey of these birds because they hibernate on the ground and these birds are, most of the time, ground feeders.

Coleoptera—Beetles

Out of the 38 per cent insect food 15 per cent were beetles. These beetles belonged to many families but most of them belonged to these families: weevil family (Curculionidae), 3 per cent; click beetle family (Elateridae), 2 per cent; June beetle family (Scarabaeidae), leaf beetle family (Chrysomelidae), ground beetle family (Carabidae), carrion beetle family (Silphidae), 1 per cent each.

Weevils were the beetles taken in greatest number. By the destruction of these insects, these birds rendered a great help to the farmers in particular and to the people in general, for these beetles are destructive. In January, weevils were 15 per cent of the food contents of the 10 stomachs of these birds examined, and 4 out of the 10 stomachs contained them (see table 3). In March, they were 11 per cent of the food contents of the 22 stomachs examined, being found in 6 stomachs out of the 22. The highest percentage of this kind of beetle in the food contents of 1 stomach was 62. In April, it was 3 per cent of the food contents of 21 stomachs examined, and it was found in 6 stomachs out of the 21. The highest percentage of this beetle in the food contents of 1 stomach was 77. In May, it was 10 per cent of the food contents of the 11 stomachs examined, and it was found in 1 stomach. It was 59 per cent in the food contents of that stomach. In February and November weevils were also taken, but the percentages were small. Weevils were the highest in percentage among all the beetles taken by the 125 birds examined. These birds then are effective in the destruction of weevils.

The click beetle family was the second highest in percentage among all the beetles found in the 125 stomachs. They were taken mostly in February for they were 7 per cent of the food contents of the 20 stomachs examined. Click beetles were found in 7 stomachs. One stomach was nearly filled with this kind of beetle, for the percentage was 94. In March, this kind of beetle was 1 per cent of the food contents of the 22 stomachs examined, being found in 2 stomachs. In May it was 2 per cent of the food contents of the 11 stomachs examined and it was found in 1 stomach only. This kind of beetle being the second highest in percentage among the beetles in the food contents of the 125 stomachs examined, shows Brewer blackbirds to be effective in destroying these harmful beetles.

June beetles, leaf beetles, ground beetles and carrion beetles were all the same in percentage in the food contents of the 125 Brewer blackbirds' stomachs examined. But in the number of items the June beetle stood foremost. It was taken mostly in March, April and June. It was taken mostly in June when it was 45 per cent of the contents of the 9 stomachs examined. It was found in 3 stomachs and one of these 3 contained 100 per cent June beetles. These June beetles (adults), although they are not as destructive as the larvae, do great damage to the plants by feeding on the leaves. The larvae are more destructive than the adults because they are root feeders and their presence is recognized only when the plants attacked become sickly. The best control is then directed to the adults, for the adults are exposed and the destruction of an adult means the destruction of many larvae. These Brewer blackbirds are a great help to the farmers and growers because they destroy the adults of this insect which is one of the most important beetles in their diet. The leaf beetles are taken mostly in January and May. In January, they were 11 per cent of the food contents of the 10 stomachs examined. In May, they were 13 per cent of the food contents of the 11 stomachs examined and were found in 3 stomachs. These beetles constituted the only food contents of 1 stomach. Ground beetles are taken mostly in January, March, May and June. In January, they were 1 per cent of the food contents of 10 stomachs, being found in 4 stomachs. In March, they were 2 per cent of the food contents of the 22 stomachs examined. They were found in only 3 stomachs. In May, they made up 3 per cent of the food contents of the 11 stomachs examined, being found in 1 stomach. In June, this beetle was 16 per cent of the food contents of the 9 stomachs examined. It was found in only 4 stomachs. It was also taken in February but the percentage was low. The ground beetles are both predacious and vegetable feeders. Economically they are not so important to deal with, because the vegetarians are quite balanced by the predacious ones. The carrion beetles were mostly taken in February, May, and June. In May, this group made up 23 per cent of the food contents of the 21 stomachs examined. It was in this month that it was taken most often. In June, it was 6 per cent of the food contents of the 9 stomachs examined. It was found in 1 stomach, in which it was the only food contained. These beetles are not important economically, for some of them feed on dead vegetable matter. The vegetarians are not a great menace to the crops and they are not important.

The other beetles taken were the darkling beetles, rove beetles and others but their numbers are so small that they do not have a great effect economically.

Orthoptera—Locusts, Grasshoppers, Crickets

Locusts were 1 per cent of the food contents of the 125 stomachs examined. Locusts were taken mostly in March, July, August, September, October and November. In March they were about one-half per cent of the food contents of the 22 stomachs examined. In July they were 73 per cent of the food contents of the 2 stomachs examined. They were found in 2 stomachs (see table 3) and comprised 73 per cent of the food contents. They were taken most often in this month. In August, this group was 15 per cent of the food contents of 2 stomachs. It was the sole food content of 1 stomach. In September, it was about 1 per cent of the food contents of 12 stomachs. In October, it was 13 per cent of the food contents of the 2 stomachs. In November, it was 1 per cent of the food contents of 9 stomachs.

Locusts are taken almost every month. Locusts are destructive to plants on account of their feeding habits. They are great eaters and they eat every leaf that they come to. These birds then may be a great help to the farmers whose crops are sometimes the victims of these voracious plant feeders.

Lepidoptera—Moths and Butterflies

Caterpillars were the ones mostly taken. They were 1 per cent of the food contents of the 125 stomachs. They were taken mostly in January, February, March, April and May. In January they were 1 per cent of the food contents of the 10 stomachs. In February this group was 6 per cent of the food contents of the 20 stomachs; in March, it was 1 per cent of the food contents of the 22 stomachs; in April, it was about 1 per cent of the food contents of the 27 stomachs. It was in May that it was taken the most, for it is the time of the year that caterpillars are abundant. Caterpillars are foliage feeders. They are such great feeders that they can easily defoliate a big tree, of course depending upon the number present. Brewer blackbirds are a great help to the farmers and growers by destroying these destructive larvae.

Hymenoptera

In the order Hymenoptera, the ants, family Formicidae, were the ones mostly taken. They comprised 18 per cent of the whole food contents of the 125 stomachs. These insects live in colonies in such great numbers that no matter how much is taken their number seems not to be reduced. Economically these insects are not so important except from the public health point of view. But these ants taken were not house invaders, so we are not affected by them. They were taken mostly in February, March, April and September. In February, they were taken the most, for they were 44 per cent of the food contents of the 20 stomachs examined. In March, the group was 35 per cent of the food contents of 22 stomachs, and in April, it was 27 per cent of the food contents of the 21 stomachs.

Miscellaneous Insects

Diptera, mostly larvae, were taken. They were 1 per cent of the food contents of the 125 stomachs examined. The larvae taken were the ones found in manure.

Hemiptera were not important as food for these birds. Only 1 hemipterous insect, family Scutelleridae, was taken and it was taken in March.

Chilopoda and Arachnida

Only one centipede and 1 spider were taken. The former was taken in February and the latter was taken in June.

Vegetable Food

Vegetable food was 62 per cent of the food contents of the 125 stomachs examined. The monthly percentages of the vegetable food were: January, 51; February, 39; March, 45; April, 91; May, 30; June, 0; July, 19; August, 84; September, 89; October, 56; November, 95; December, 97. (See table 1.)

Cereals

Wheat Grains

Among the vegetable food, grains of wheat ranked the highest. It was 30 per cent of the food found in the 125 stomachs examined. In January, it was 26 per cent of the food contents of the 10 stomachs examined. Only 1 of these 10 stomachs did not contain grains of wheat (see table 4). The highest percentage of grains of wheat in a stomach was 84. In February, it was 27 per cent of the food contents of the 20 stomachs. It was found in 14 stomachs. In March, it was 29 per cent of the food contents of the 22 stomachs. It was found in 12 stomachs and the highest percentage in a stomach was 100. In April, it was 16 per cent of the food contents of the 21 stomachs. It was found in 14 stomachs and the highest percentage in a stomach was 20. In May, it was 7 per cent of the food contents of the 11 stomachs. It was found in five stomachs and the highest percentage in one stomach was 85. In June no vegetable food was found in 9 stomachs. In July, practically no vegetable food was found. In August it was 84 per cent of the food found in 2 stomachs. Only 1 of the stomachs contained it and it was the only vegetable food. In September, it was 56 per cent of the food contents of the 12 stomachs. It was found in 9 stomachs, and the highest percentage in a stomach was 94. In October it was 39 per cent of the food found in the 2 stomachs. It was found in both of them. In November, it was 82 per cent of the food found in 9 stomachs. It was found in 6 stomachs and 1 stomach contained only wheat grains as the food contents. In December, it was 72 per cent of the food contents of the 5 stomachs. Only 1 stomach did not contain it, and another stomach did not contain any vegetable food except grains of wheat.

In winter months the percentages of wheat grains taken were high, due to the fact that the insects were then hibernating. Although the percentages were high these grains were considered waste grains and economically they were of no importance. In February and March the percentages of wheat grains taken in northern California were 27 and 29 respectively. Planting of cereals takes place in these

months. Taking for granted that these grains were the sown seeds uncovered, the damage the birds did was not great because the percentages were not high. During harvest season, which takes place in June and July, the percentages were very low due to the fact that insects were abundant at this time, especially the June beetles. This shows that these birds are more insectivorous in habit than vegetarian. In August the percentage was high but these grains were considered waste grains, for harvest was already finished.

Barley and Oat Grains

Barley grain was taken only in the months of March and April. In March it was 2 per cent of the food contents of 22 stomachs. In April it was only 1 per cent of the food contents of 21 stomachs.

Oat grain was taken only in April and May. In April it was about 1 per cent of the food contents of 21 stomachs. In May it was 2 per cent of the food contents of 11 stomachs.

Both of these cereals were taken in such a very small percentage that economically they are not important.

Miscellaneous Vegetable Food

In the 125 stomachs 19 per cent of the food contents was red-stem filaree (*Erodium cicutarium*). It was taken in January, February, March, April, September and October. It was mostly taken in April and September, when it was 73 and 31 per cent, respectively, of the food contents of the 21 and 12 stomachs. Rough pigweed (*Amaranthus retroflexus*) was 3 per cent and was taken in January, February, and March. Common knotweed (*Polygonum lapathifolium*) was about 3 per cent and taken in January, February, March, November and December. Common chickweed (*Stellaria media*) was 2 per cent and taken in February and November. Water grass (*Echinochloa crus-galli*) was taken in January and September. The percentage was so small as not to be significant.

Group II

Animal Food

In the yearly food contents of the 90 stomachs of the Brewer blackbirds examined, 12 per cent was animal food, consisting almost wholly of insects. The monthly percentages of insect food were: January, 14; February, 11; March, 22; April, 14; May, 35; June, 100; July, 100; September, 1; November, 0; December, 19. (See table 1).

No stomachs taken in August and October were examined.

Coleoptera—Beetles

Out of the 12 per cent insect food, 6 per cent was Coleoptera beetles). These beetles belonged to many different families and the most important families were: leaf beetle family (Chrysomelidae), weevil family (Curculionidae), June beetle family (Scarabaeidae), rove beetle family (Staphylinidae), carrion beetle family (Silphidae), darkling ground beetle family (Tenebrionidae), ground beetle family (Carabidae).

The leaf beetle family was taken more often than other kinds of beetles. It was taken in January, February, March, April, July and December. It was taken mostly in January and March. In January

it was 19 per cent of the food contents in the 19 stomachs examined. It was found in 3 stomachs (see table 3) and the highest percentage in a stomach was 69. In February it was 1 per cent of the food contents in 9 stomachs. In March it was 1 per cent of the food contents of 18 stomachs. In April it was 8 per cent of the food contents of 12 stomachs. In July it was 2 per cent of the food contents of 7 stomachs. In December it was 8 per cent of the food contents of 6 stomachs.

A leaf beetle is a destructive insect to plants. Birds destroying this insect may be a help to the farmers and growers.

The weevil group was taken mostly in January, February, and March. In January it was 3 per cent of the food contents of the 19 stomachs examined. It was found in 3 stomachs and the highest percentage in a stomach was 35. In February it was 1 per cent of the food contents of 9 stomachs. In March it was 1 per cent of the food contents of 18 stomachs. It was found in 3 stomachs and the food content of 1 stomach was solely weevil.

A weevil is a destructive insect, and birds destroying it may be doing a great help to the farmers and growers.

The June beetle family was taken mostly in April and July. In April it was 10 per cent of the food contents of 12 stomachs. In July it was 2 per cent of the contents of 7 stomachs. Both the adults and larvae of this family are destructive to plants and it is always desirable that they be killed.

The darkling ground beetle family was taken mostly in January, February, March, April, May, July and September. It was the most widely taken among the beetles. The highest percentages were taken in May and July. In May it was 5 per cent of the food contents of the 3 stomachs examined, and it was 4 per cent of the food contents of the 7 stomachs in July. The members of the darkling ground beetle family are both predacious and vegetarian.

The click beetle family was taken in February, March, April and May. It was mostly taken in March and in May In March it was 1 per cent of the food contents of the 18 stomachs examined. In May it was 2 per cent of the food contents of 3 stomachs.. This family of beetle is destructive and it is always advisable that they be destroyed.

The other families of beetle—rove beetle (Staphylinidae), carrion beetle (Silphidae), ground beetle (Carabidae)—taken were both predacious and vegitarian. In some cases predacious ones are beneficial, but in some cases they are destructive because they feed on other predacious insects that feed on destructive insects. Others, which are vegetarian, are destructive to our crops. As a food of these Brewer blackbirds, their percentages are so small that economically, in either direction, they are not important.

Lepidoptera—Caterpillars

Caterpillars made up 6 per cent of the yearly food contents of the 90 stomachs of Brewer blackbirds examined. They were taken mostly in January, February, March, and June. Highest percentages were taken in February, March and June. In February, the group was 2 per cent of the food contents of 9 stomachs. In March, it was 2 per cent of the food contents of 18 stomachs. In June, it was 66 per cent of the food contents of the only stomach examined.

Orthoptera—Locusts, Crickets, Grasshoppers

The locust group was 1 per cent of the yearly food contents of the 90 stomachs examined. It was taken mostly in March, May, and July. In March, it was 2 per cent of the food contents of the 18 stomachs examined. In May, it was 5 per cent of the food contents of the 3 stomachs examined. In July, it was 41 per cent of the food contents of the 7 stomachs.

Crickets were taken in January and March. In January, they were 4 per cent of the food contents of the 19 stomachs examined. In March, they made up less than 1 per cent of the contents of 9 stomachs.

Homoptera—Aphids and Leafhoppers

In March, aphids were 3 per cent of the food contents of the 18 stomachs examined. In April, leafhoppers were 1 per cent of the food contents of the 12 stomachs examined. These two insects are destructive to plants, especially to crops. Their destruction helps the farmers and growers.

Miscellaneous Insect Food

Diptera were taken in January and March. They were taken mostly in March, for the percentage of the food contents of the 18 stomachs examined was 7. Hemiptera were taken in February, March and July—most of them belonging to the family Miridae. It was mostly taken in July, for it was 14 per cent of the food contents of the 7 stomachs examined. Among the Hymenoptera, the family Formicidae was taken the most. It was taken in February, March and December. It was taken most often in December, when it was 15 per cent of the food contents of the 6 stomachs examined.

Chilopoda and Arachnida

Chilopods were taken in March, although only 3 in number.

Arachnids were taken in February, March and April. Only 1 arachnid was taken in each month.

Vegetable Food

In the yearly food (average of ten months) of the 90 stomachs examined, 68 per cent was vegetable food. The monthly percentages of vegetable food were: January, 86; February, 89; March, 78; April, 86; May, 65; June, 0; July, 0; September, 99; November, 100; December, 81. No stomachs were examined for August and October. (See table 1.)

CEREALS

Wheat

Of the 68 per cent vegetable food, 20 per cent was wheat grain. Wheat grains were taken in the months of January, February, March, April, November, and December. They were taken thus mostly in the winter months. In January, wheat grain was 63 per cent of the food contents of the 19 stomachs examined. It was found in 18 stomachs (see table 4) and the highest percentage in a stomach was 100. In February, it was 52 per cent of the food contents of the 9 stomachs. The highest percentage in a stomach was 96. In March, it was 8 per cent of the food contents of the 18 stomachs. It was found in 4 stomachs, and the highest percentage in a stomach was 100. In April,

it was 9 per cent of the food contents of the 12 stomachs. It was found in 2 stomachs and the highest percentage in a stomach was 93. In November, it was 16 per cent of the food contents of the 8 stomachs examined. It was found in 4 stomachs, and the highest percentage in a stomach was 95. In December, it was 51 per cent of the food content of the 6 stomachs examined. It was found in all 6 stomachs and the highest percentage in a stomach was 100.

Oat Grain

Oat grain was taken in February, April and September. In February, it was 2 per cent of the food contents of the 9 stomachs examined. In April, it was 14 per cent of the food contents of the 12 stomachs examined. In September, it was taken most often. It was 30 per cent of the food contents of the 7 stomachs examined. It was found in 4 stomachs and the highest percentage in a stomach was 95.

Sorghum Grain

Sorghum halepensis was taken in January and March. The percentages were so small that they are of no importance at all.

Cereals were taken mostly when there were no insects. In June and July, the harvest time for wheat and oats, none of these cereals was taken, because at these times insects were abundant, showing that these birds are more insectivorous than vegetarian. Most of the cereals taken in November, December, January, and February were taken near barns and stables and some from the newly sown seeds uncovered. Such being the case, these birds during planting seasons are not destructive, and the destruction they do is small in comparison with the benefit they give during the rest of the year.

The percentage of oat grain taken was so small that it has no economic bearing.

Miscellaneous Vegetable Food

In the 90 stomachs examined, 29 per cent of the food contents was red-stem filaree (*Erodium cicutarium*). It was taken mostly in January, February, March, April, May, September, and November. *Amaranthus blitoides* was 4 per cent; common knotweed, 3 per cent; *Panicum,* 23 per cent; rough pigweed, 1 per cent; *Amsinckia,* 1 per cent. Most of these were taken in the months when insects were few.

Seeds of berries of the genus *Ribes* were taken in May and September. They were so few that economically they are of no importance.

Group III
Animal Food

In the yearly food contents of the 70 stomachs of Brewer blackbirds examined, 9 per cent was animal food, all insects. The monthly percentages of the insect food were: January, 2.4; February, 0.9; April, 75; May, 74; June, 83; October, 20; November, 8; December, 0. No stomachs were examined in March, July, August and September. (See table 1.)

Coleoptera—Beetles

Out of the 9 per cent insect food, 3 per cent was Coleoptera (beetles). These beetles belonged to several different families and the most important families were: leaf beetle family (Chrysomelidae),

ground beetle family (Carabidae), darkling ground beetle family (Tenebrionidae), rove beetle family (Staphylinidae), weevil family (Curculionidae), June beetle family (Scarabaeidae).

In the yearly food contents of the 70 stomachs examined, every family of beetle was less than 1 per cent. Most of the beetles taken belonged to the leaf beetle family and they were taken in January, May, October and November and the number of items taken were three, ten, two and two, respectively. The second in number was the ground beetle family. They were taken in January, April, May and June. The number of items in each month was: January, 1; April, 2; May, 7; June, 1. The third was the darkling ground beetle family. They were taken in February, April, May, June and October and the numbers of items taken in each month were one, six, one, two and three. The fourth was the rove beetle family. They were taken in April and May. The fifth was the weevil family. They were taken in February, April, May and November and the numbers of items taken in each month were one, three, one and two, respectively. The sixth was the June beetle family. They were taken in January, April and December, and the number of items taken in each month was two, two and three respectively. The number of stomachs examined in each month was: January, 13; February, 12; April, 4; May, 3; June, 4; October, 12; November, 11; December, 11. In spite of the fact that the numbers of stomachs examined in April, May, and June were few, more insects than seeds were taken. This is due to the abundance of insects in these months.

Miscellaneous Insect Food

Diptera were taken in January, April, June and November. They were taken mostly in June and November and the numbers of items taken were 31 and 29 respectively.

Hymenoptera were taken in January, October, and November. Most of them belong to the ant family (Formicidiae). In January 2 Hymenoptera were taken; in October, 37; in November, 3.

Orthoptera were taken in June and October. In June, 6 locusts (Locustidae) and 2 crickets (Gryllidae) were taken. In October, only 1 locust (Locustidae) was taken.

Vegetable Food

Vegetable food was 91 per cent of the food contents of the 70 stomachs of Brewer blackbird examined. The monthly percentages were: January, 97.6; February, 99.1; April, 25; May, 26; June, 17; October, 80; November, 92; December, 100. (See table 1.)

Cereals

Wheat and Oats

Among the vegetable food items, wheat grain ranked the highest. It was 26 per cent of the food contents of the 70 stomachs examined. In January it was 32 per cent of the food contents of the 13 stomachs examined. It was found in 10 stomachs (see table 4), and the highest percentage in a stomach was 100. In February, it was 59 per cent of the food contents of the 12 stomachs. It was found in all the 12 stomachs and the highest percentage in a stomach was 100. In April,

it was 25 per cent of the food contents of the 4 stomachs. In June, it was 12 per cent of the food contents of the 4 stomachs. In October, it was 59 per cent of the food contents of the 12 stomachs. In November, it was 12 per cent of the food contents of the 11 stomachs. In December, it was 2 per cent of the food contents of the 11 stomachs.

The highest percentages of wheat grain were taken in February just after planting and in September just before planting. These grains then were probably waste grains. The grains of wheat taken during planting were few and the chances are that these grains were taken, near stables and barns. Only 6 grains of wheat were taken in June—the harvest month.

Oat grain was taken in May, just before harvest. It was 36 per cent of food contents of the 3 stomachs examined.

Sorghum

Sorghum was taken in January, June, October, November and December. It was 2 per cent of the food contents of the 70 stomachs examined. Most of these grains were the wild corn (*Sorghum halepensis*). The highest percentage was taken in October. It was 15 per cent of the food contents of the 12 stomachs examined. Although it was taken during harvest time the percentage was small so that the destruction probably would not be felt.

Hordeum—Wild Barley

Hordeum was taken in January, October, November and December. It was taken mostly in December and January. In December, it was 21 per cent of the food contents of the 11 stomachs examined. In January, it was 10 per cent of the food contents of the 13 stomachs examined. For the rest, the percentages were very low.

Miscellaneous Vegetable Food

Amaranthus blitoides made up 5 per cent of the food found in the 70 stomachs examined. It was taken only in November. Knotweed (*Polygonum*) was 11 per cent, and was taken in January, February, October, November and December. Red-stem filaree (*Erodium cicutarium*) was 1 per cent and was taken in January, February, June, October and November. *Phalaris* was 1 per cent and taken in January, February and November. Rough pigweed was 1 per cent and taken in January, February and December. Foxtail grass, *Amsinckia* and *Ribes* were so few that economically they are of no importance.

FOOD HABITS OF THE RED-WINGED BLACKBIRDS

Group I

Animal Food

In the yearly food contents of the 109 stomachs of red-winged blackbirds examined, 13 per cent consisted of animal food and all of these animals were insects. The monthly percentages of insect food were: January, 15; February, 2; March, 13; April, 25; May, 11; June, 16; July, 100; August, 25; September, 8; October, 11; November, 6; December, 1.

Coleoptera—Beetles

Out of the 13 per cent insect food, 8 per cent was Coleoptera—beetles. These beetles belong to different families and the most important families were: weevil family (Curculionidae), rove beetle family (Staphylinidae), darkling ground beetle family (Tenebrionidae), ground beetle family (Carabidae), click beetle family (Elateridae), and leaf beetle family (Chrysomelidae).

The weevil group was taken the most and it was 2 per cent of the food contents of the 109 stomachs. It was taken mostly in March, May and June. In March, it was 4 per cent of the food contents of ten stomachs examined. It was found in eight stomachs (see table 5), and the highest percentage in a stomach was 50. In May, it was 3 per cent of the food contents of 20 stomachs. It was found in four stomachs and the highest percentage in a stomach was 76. It was taken the most often in June, when it was 8 per cent of the food contents of 23 stomachs. It was found in 13 stomachs and the highest percentage in a stomach was 50. The percentages of those taken in August, September and November were so low as not to be worth considering.

The rove beetle family was 1 per cent of the food contents of the 109 stomachs. It was taken mostly in April, June and August. In April, it was 6 per cent of the food contents of the 15 stomachs. In June, it was 2 per cent of the food contents of 23 stomachs. In August, it was 2 per cent of the food contents of ten stomachs.

Darkling ground beetle family was taken mostly in April and June. In April, it was 3 per cent of the food contents of the 15 stomachs. In June, it was 2 per cent of the food contents of the 23 stomachs. Economically this family of beetles is not important.

Ground beetle family was mostly taken in April, May and August. In April, it was 4 per cent of the food contents of the 15 stomachs. In May, it was 1 per cent of the food contents of the 20 stomachs. In August, it was 2 per cent of the food contents of the ten stomachs. Having the same status as the darkling ground beetle family, this family is not important.

Click beetles were taken mostly in January. This group was 2 per cent of the food contents of the four stomachs. These beetles are destructive.

Leaf beetles were taken mostly in October. They were 1 per cent of the food contents of the 15 stomachs. This kind of beetle is destructive.

Lepidoptera—Caterpillars

Caterpillars were 1.6 per cent of the yearly food contents of the 109 stomachs.They were taken mostly in January, April, May, June and October. In January, they were 9 per cent of the food contents of the four stomachs examined. In April, they were 5 per cent of the food contents of the 15 stomachs. In May, they were 3 per cent of the food contents of the 20 stomachs. In June, they were 2 per cent of the food contents of the 23 stomachs. In November, they were 4 per cent of the food contents of the 11 stomachs. These insects are destructive insects due to their feeding habits (vegetarian) and their elimination locally is desirable.

Orthoptera—Locusts, Crickets, and Cockroaches

The locust group was taken in June, July, and August. It was taken mostly in July and August. In July, it was 100 per cent of the food contents of the only stomach examined. In August, it was 18 per cent of the food contents of the 10 stomachs. It was found in 7 stomachs and the highest percentage in a stomach was 60.

Only 1 cricket was taken, and it was taken in December.

Only 1 cockroach was taken, and it was taken in January.

Miscellaneous Insect Food

Diptera were taken in March, April, May and June. They were taken mostly in April, when they were 3 per cent of the food contents of the 15 stomachs examined.

Hemiptera were taken in April, May, June, and October. This order was taken mostly in April and June, when the percentages were about 1 per cent of the food contents of the 15 and 23 stomachs, respectively.

Only 2 Homoptera (family Jassidae) were taken in March.

In Hymenoptera, only insects belonging to the family Formicidae were taken. They were taken in March, May, August, September, and October, but most were taken in September, when they were 7 per cent of the food contents of the 9 stomachs examined.

Arachnida

Only 3 Arachnida were taken. Two were taken in April and one in May.

Vegetable Food

Vegetable food was 87 per cent of the yearly food contents of the 109 stomachs of the red winged blackbirds examined. The monthly percentages of the vegetable food were: January, 85; February, 98; March, 87; April, 75; May, 89; June, 84; July, 0; August, 75; September, 92; October, 89; November, 94; December, 99.

These birds are vegetarians. Not less than three-fourths of the monthly food contents of the stomachs was vegetable food. In July no vegetable food was taken. It is not wise to conclude that in July, then, birds do not take vegetable food, for only 1 stomach was examined and it happened that the only food it contained was locust.

Cereals

Wheat and Oat Grains

Among the vegetable foods taken wheat grain was the highest in percentage. It was 17 per cent of the yearly food contents of the 109 stomachs examined. It was taken in every month except July, in which its presence is doubtful. In January, it was 46 per cent of the contents of 4 stomachs. It was found in 2 stomachs (see table 6) and it was 77 per cent of the food contents of 1 stomach. In February it was found in 1 of the 2 stomachs examined. It was 98 per cent of the food contents of that stomach. In April, it was 4 per cent of the food contents of the 15 stomachs. It was found only in 1 stomach and it was 90 per cent of the food contents of that stomach. In May, it was 3 per cent of the food contents of the 20 stomachs. It was found in 3 stomachs and it was the only vegetable food in 1

stomach. In June, it was 13 per cent of the food contents of the 23 stomachs. It was found in 8 stomachs and its highest percentage in a stomach was 89. In August, it was 66 per cent of the food contents of the 10 stomachs. It was found in 7 stomachs and its highest percentage in a stomach was 88. In September, it was 27 per cent of the food contents of the 9 stomachs and in 1 stomach there was no vegetable food except grains of wheat. In October, it was 27 per cent of the food contents of the 11 stomachs. It was found in 7 stomachs and in 1 stomach it was the sole vegetable food. In November, 2 of the 3 stomachs examined contained only grains of wheat. In December, the only stomach examined contained 33 per cent grains of wheat.

Oat grain was taken only in March. It was found in 1 stomach. Its highest percentage in a stomach was 78, and it was 3 per cent of the food contents of the 10 stomachs.

In northern California, north of the Sacramento Valley, these birds are quite destructive to the cereals. In this part of the State wheat grains are planted in spring and fall and these birds are apt to get the uncovered grains.

Sorghum Grain

Most of the grain of sorghum taken was of the wild one—Johnson grass (*Sorghum halepensis*). It was taken mostly in January, November and December. It was 9 per cent of the yearly food contents of the 109 stomachs. It was taken mostly in December, when it was 65 per cent of the food contents of the 1 stomach examined.

Miscellaneous Vegetable Food

Amaranthus blitoides was 4 per cent of the yearly food contents of the 109 stomachs. It was taken in April and June. Rough pigweed *(Amaranthus retroflexus)* was 2 per cent of the yearly food of the 109 stomachs. It was taken in February and March. Common chickweed *(Stellaria media)* was 11 per cent of the yearly food contents of the 109 stomachs. It was taken in April, May, and June. Red-stem filaree *(Erodium cicutarium)* was 8 per cent of the yearly food contents of the 109 stomachs. It was taken in March, April, May, June, August, September, and October. It was mostly taken in May. Water grass *(Echinochloa crusgalli)* was 8 per cent of the yearly food contents of the 109 stomachs. It was taken in January, September and October. It was taken mostly in September. *Lupinus* was taken in March and September. It was 8 per cent of the yearly food contents of the 109 stomachs. *Montia* was 2 per cent. It was taken in May and June. *Datisca glomerata* was taken in May. *Polygonum* was taken in January, April, May, August, September, October and December. It was widely taken but the percentages were very low. *Amsinckia* was taken only in June.

Group II

Animal Food

Animal food was 30 per cent of the yearly food contents of the 80 stomachs of red-winged blackbirds examined. Out of 30 per cent animal matter, 29 per cent was insect food. The monthly percentages of insect food were: January, 9; February, 25; March, 37; April,

19; May, 59; June, 86; July, 96; August, 39; October, 2; November, 12; December, 0. No stomach taken in September was examined.

Coleoptera—Beetles

Coleoptera made up 20 per cent of the yearly food contents of the 80 stomachs examined, showing that beetles dominated in the insect food. The chief families of beetles taken were: hister beetle (Histeridae), rove beetle (Staphylinidae), leaf beetle (Chrysomelidae), weevil (Curculionidae), ground beetle (Carabidae), June beetle (Scarabaeidae), darkling ground beetle (Tenebrionidae).

The rove beetle family was the highest in percentage among all the families of beetles taken. It was 2 per cent of the yearly food of the 80 stomachs. It was taken in February and mostly in August, where it was 4.6 per cent of the food contents of the 12 stomachs examined. Economically this family is not important. .

The family Histeridae was the second in rank. It was taken only in August, when it was 3 per cent of the food contents of the 12 stomachs examined. This family of beetles is not important economically.

The leaf beetle family was the most widely taken. It was 1 per cent of the yearly food of the 80 stomachs. It was taken in February, April, May, June, August, and November. In February, it was 16 per cent of the food contents of the 7 stomachs examined. In April, it was 1 per cent of the food contents of the 6 stomachs. In June, it was 14 per cent of the food contents of the 2 stomachs. In August, it was less than 1 per cent of the food contents of the 12 stomachs. In November, it was 6 per cent of the food contents of the 4 stomachs. They are destructive beetles and their elimination is desirable.

Weevils were taken in April, May, and August. In August, they were less than 1 per cent of the food contents of the 12 stomachs. In April, they were 4 per cent of the food contents of 6 stomachs. In May, they were 8 per cent of the food contents of the 16 stomachs. They were found in 4 stomachs and its highest percentage in a stomach was 50. Weevils are destructive beetles and their elimination is highly desirable.

Ground beetle family was taken in January, April and May. It was taken mostly in April and May when they were 4 and 6 per cent of the food contents of the 6 and 16 stomachs, respectively. Economically these beetles are not important.

The darkling beetle group was taken in January, February, June, and November. Only a few were taken. Carrion beetles were taken in March, April, May, and July. Only small numbers were taken. Only 2 click beetles were taken—1 in April and 1 in October. Only 2 metallic wood borers were taken and they were taken in February.

Lepidoptera—Caterpillars

Caterpillars were 2.4 per cent of the food contents of the 80 stomachs. This group was taken in March, May, October, and November. It was taken mostly in March and May when it was 11 and 26 per cent of the food contents of the 2 and 16 stomachs, respectively. Caterpillars are not desirable, being destructive insects.

Orthoptera—Locusts and Crickets

Locusts were 4 per cent of the yearly food contents of 80 stomachs. They were taken mostly in January, March, May and July. In January, they were 3 per cent of the food contents of the 11 stomachs. In March, they were 5 per cent of the food contents of the 2 stomachs. In May, they were 6 per cent of the food contents of 16 stomachs. They were taken most often in July. They were 93 per cent of the food contents of 4 stomachs. They were found in 3 of the 4 stomachs and the highest percentage in a stomach was 100.

Crickets were taken in January, April, May, and June. They were .6 per cent of the yearly food contents of the 80 stomachs.

Both of these families of insects are destructive. Their elimination is also desirable.

Homoptera

Aphids were taken in May, comprising 25 per cent of the food contents of the 16 stomachs. They were 2 per cent of the yearly food contents of the 80 stomachs. Aphids are destructive insects and their elimination is highly desirable.

Miscellaneous Insect Food

Diptera were taken in May and mostly in August, being 2 per cent of the yearly food contents of the 80 stomachs.

Only 5 Hemiptera were taken, 4 in May and 1 in August.

Chilopoda and Arachnida

Only 4 Chilopoda were taken in April. They belonged to the family Geophilidae. Only 1 arachnid was taken in January.

Vegetable Food

Vegetable food was 70 per cent of the yearly food contents of the 80 stomachs. The monthly percentages of vegetable food were: January, 91; February, 75; March, 63; April, 81; May, 42; June, 14; July, 4; August, 61; October, 98; November, 88; December, 100. (See table 2.)

Cereals

Wheat Grain

Out of the 70 per cent of yearly vegetable food of the 80 stomachs, 13 per cent was wheat grain and 4 per cent was oat grain.

Wheat grain was taken in January, February, April, May, June, August, October and November. In January, it was 16 per cent of the food contents of the 11 stomachs. It was found in 4 (see table 6), and the highest percentage in a stomach was 97. In February, it was 28 per cent of the food content of the 7 stomachs. It was found in 3 stomachs and the highest percentage in a stomach was 87. In April, it was 10 per cent of the food contents of the 6 stomachs. It was found only in 1 stomach and the percentage in that stomach was 77. In May, it was 26 per cent of the food contents of the 16 stomachs. It was found in 3 stomachs and the highest percentage in a stomach was 90. In June, it was 14 per cent of the food contents of the 2 stomachs. In October, it was 22 per cent of the food contents of 8 stomachs. It was found in 2 stomachs and 1 stomach contained

only wheat grain as vegetable food. In December, it was 63 per cent of the food contents of the 8 stomachs. It was found in 2 stomachs and 1 stomach contained only wheat grain as food.

Oat Grain

Oat grain taken was 4 per cent of the yearly food contents of the 80 stomachs. It was taken in January, March, April, and May. In January, it was 30 per cent of the food contents of the 11 stomachs examined. It was found in 1 stomach, and the percentage in that stomach was 70. In March, it was 70 per cent of the food contents of 2 stomachs and it was 100 per cent in 1 of the stomachs. In April and May, it was 1 and 5 per cent of the food contents of 6 and 16 stomachs, respectively.

Rice Grain

Rice grain was 6 per cent of the yearly food contents of the 80 stomachs. It was taken in August and November. In August, it was 11 per cent of the food contents of the 12 stomachs examined. It was found in 5 stomachs and the highest percentage in a stomach was 84. In November, is was 59 per cent of the food contents of the 4 stomachs. It was found in 2 stomachs and in one of these it was 100 per cent.

Planting of wheat is done in the months of November to February and harvest takes place in June to July. In the planting season the grains of wheat taken by these birds are high in percentages and if these grains are taken from the sown fields, for these birds are apt to get the uncovered grains, then these birds at this time of the year are destructive. At harvest season more insects are taken than grains of wheat, showing that they prefer insects when available to grain. At this time of the year the birds are beneficial.

Planting and harvesting season for oats is much the same as for wheat. To oats the birds are also destructive.

Planting of rice grain is done in April to May, and harvesting is done from October to December. The grains of rice taken in August are considered waste grains, but those taken in December, which are high in percentage (for the sole food found in 1 stomach was grains of rice) are considered valuable. If these grains were taken in the field, then red-winged blackbirds are destructive to rice crops at this time of the year.

Miscellaneous Vegetable Food

Water grass (*Echinochloa crusgalli*) was taken the most often. It was 16 per cent of the food contents of the 80 stomachs examined. It was taken in August and October, but mostly in August, when it was 12 per cent of the food contents of the 12 stomachs.

Knotweed (*Polygonum*) was 9 per cent of the yearly food contents of the 80 stomachs. It was taken in January, May, July, August, October, November and December. In November and December it was 28 and 36 per cent of the food contents of the 4 and 8 stomachs, respectively.

Panic grass (*Panicum*) was 6 per cent of the yearly food of 80 stomachs. It was taken only in October.

Red-stem filaree (*Erodium cicutarium*) was 5 per cent of the yearly food contents of the 80 stomachs. It was taken in January, April, May,

August and December. It was taken mostly in May, when it was 17 per cent of the food contents of the 16 stomachs.

Rough pigweed (*Amaranthus retroflexus*) was 4 per cent of the food contents of the 80 stomachs. It was taken in February, April, May, and August. It was taken mostly in April, when it was 72 per cent of the food contents of the 6 stomachs.

Wild barley (*Hordeum*) was taken only in August. It was 7 per cent of the food contents of the 12 stomachs.

Other plants were also taken, but their percentages are too small to be important.

Group III

Animal Food

There were only 26 stomachs of red-winged blackbirds in this group. These stomachs were taken in April, May and June, and the numbers of stomachs in each month were: April, 7; May, 16; June, 3. In these 3 months, the percentage of animal food found in these 26 stomachs was 71, all insects.

Coleoptera—Beetles

Beetles were 30 per cent of the food contents of these 26 stomachs. The most important families of beetles taken and their percentages in the food contents of the 26 stomachs were: June beetle (Scarabaeidae), 3; weevil (Curculionidae), 13; leaf beetle (Chrysomelidae), 6; carrion beetle (Silphidae), 3; darkling ground beetle (Tenebrionidae), 3; ground beetle (Carabidae), 2.

June beetles were taken mostly in April. They were 3 per cent of the food contents of 7 stomachs. Weevils were taken mostly in April, when they were 24 per cent of the food contents of the 7 stomachs. Leaf beetles were taken mostly in May, when they were 8 per cent of the food contents of the 16 stomachs. Carrion beetles were taken mostly in April, when they were 33 per cent of the food contents of the 7 stomachs. Darkling ground beetles were taken mostly in April, when they were 5 per cent of the food contents of the 7 stomachs. Ground beetles were taken mostly in June.

Miscellaneous Insect Foods

Diptera made up 13 per cent of the food contents of the 26 stomachs, being taken mostly in April.

Homoptera made up 4 per cent of the food contents of the 26 stomachs. They belonged to the leafhopper family (Jassidae). They were taken only in May.

Lepidoptera were taken in June, and constituted 4 per cent of the food contents of the 26 stomachs.

The order Hymenoptera made up 21 per cent of the food contents of the 26 stomachs. It was taken in May, and was represented by the family of ants (Formicidae).

Vegetable Food

Vegetable food made up 29 per cent of the food contents of the 26 stomachs. Most of the vegetable matter taken was wheat and oat grain. Wheat grain was taken every month and the percentages in

each month were: April, 26 in 7 stomachs; May, 11 in 16 stomachs; June, 7 in 3 stomachs.

Oat grain was taken in April and May, and the percentages were 7 and 3, respectively.

Knotweed was also taken in May and June.

Johnson grass was taken in June and red-stem filaree was taken in May and June.

In these months these birds are beneficial, for insects are taken in greatest proportion as a part of their diet. Cereals taken in these months are considered waste grain, and economically they amount to nothing at all.

SUMMARY

The Brewer blackbirds in geographic group I are found to be more vegetarian than insectivorous. Insects are taken in greatest proportion from May to July (see table 1). Insect food in January is 49 per cent of the total, and it rises up to June and July when it reaches the highest percentages, then it goes down until December, when it reaches the lowest percentage, roughly speaking; for the rise and fall are not continuous.

Vegetable food is in highest percentage when insects are taken least, due to their scarcity. Insects hibernate during winter and they are not easily found by these birds. In the absence of insects, vegetable food is resorted to. In the months when insects and vegetable food, especially cereal in the harvest season, are both abundant, vegetable food is taken less, showing that these birds are primarily more insectivorous in food habits than vegetarian.

Most of the insects taken belong to the destructive families of insects from the point of view of the farmer and fruit grower. Very few of the beneficial insects are taken. The destruction of these harmful insects means a great help to farmers and growers in particular, and to consumers in general.

Cereals are the vegetable foods taken most. They are taken almost every month, whether it be harvesting or planting season. In June and July, which are the harvest months, the percentage of cereals taken, if taken at all (it happened that in group I no cereal was taken), is very low, because at this time insects abound. From November to February and August to October, the planting seasons, in this group (I), most of the vegetable matter taken is cereal. But most of this cereal is not taken from the newly planted seeds, for the birds take sown seeds uncovered, as also grain from pastures, barnyards, orchards and grain fields. Economically, this cereal is not important and it can be considered waste grain.

The rest of the vegetable food is almost all weed seeds. Bryant (1914) defines weeds as "plants out of place." These plants are not economically important, but their destruction is desirable because, if they are allowed to grow, they compete with the cultivated plants which results in the diminution of the crop's yield, in quantity as well as in quality. If weeds are not to be allowed to compete with the crops, a certain amount of energy and time is expended by the farmer toward their destruction. By the destruction of the seeds of weeds, blackbirds give appreciable help to the farmers.

Brewer blackbirds in geographic groups II and III were found to be practically the same in food habits and economic status as those of Group I. (See table 1.)

The red-winged blackbirds are found to have, as a rule, the same food habits and economic status as the Brewer blackbirds except that the red-wings in Group I get less cereal in their yearly food. The difference is not great. This difference is due, perhaps, to the fact that more stomachs of the red-winged blackbird were obtained in April and May, the breeding months, when they feed mostly on insects and when insects are more abundant. On the other hand, fewer stomachs of the other species were examined in these two months. In Group I more vegetable food was taken in all the months in spite of the fact that more stomachs were examined, showing that red-winged blackbirds are more vegetarian than the Brewer blackbirds.

The Brewer and red-winged blackbirds, in food habits, are both primarily insectivorous. But in the absence of insects they are vegetarian, and cereal is taken whenever it is available. Being gregarious birds before and after the breeding season their depredations in grain fields cannot be denied. The degree of destruction that they do depends upon the size of a flock and the size and location of the grain field. Their destruction could be easily felt, if the flock is big and the grain field is small; the reverse also is true.

CONCLUSION

Economically, in the widest human interests, the Brewer and red-winged blackbirds are beneficial, being more insectivorous than vegetarian in food habits. However, being gregarious birds, they can now and then inflict such great damage on crops that to give them full protection is not fair to the farmer whose crops are immediately threatened. It is wisest, then, that these birds be protected during the breeding season when they destroy many insect pests, and that farmers and growers allow them to nest on their farms. But when and where they become vegetarian and inflict real damage to crops, then their numbers should be reduced, though only to such degree that the damage done by those remaining can hardly be felt.

We need the record of more observations of this sort in order that we may better verify the facts and more accurately fix the dates.—N. B. Seofield, 510 Russ Building, San Francisco, August 17, 1931.

TABLE 1

Proportions of Important Kinds of Food of the Brewer Blackbird. Showing the Percentages of All the Food for Each Month

Group I

	January	February	March	April	May	June	July	August	September	October	November	December
No. of Brewer Blackbirds	10	20	22	21	11	9	2	2	12	2	9	5
Insect food	49	61	55	9	70	100	81	16	11	44	5	3
Vegetable food	51	39	45	91	30	0	19	84	89	56	95	97
Coleoptera	29	15	17	5	62	96	8	0	2	0	1	0
Cereal	26	27	29	16	9	0	0	84	55	39	82	72

Group II

	January	February	March	April	May	June	July	August	September	October	November	December
No. of Brewer Blackbirds	19	9	18	12	3	1	7	----------	7	----------	8	6
Insect food	14	11	22	14	35	100	100	----------	1	----------	0	19
Vegetable food	86	89	78	86	65	0	0	----------	99	----------	100	81
Coleoptera	9	7	4	12	29	33	44	----------	0	----------	0	4
Cereal	63	54	8	23	0	0	0	----------	30	----------	16	51

Group III

	January	February	March	April	May	June	July	August	September	October	November	December
No. of Brewer Blackbirds	13	12	----------	4	3	4	----------	----------	----------	12	11	11
Insect food	2.4	0.9	----------	75	74	83	----------	----------	----------	20	8	0
Vegetable food	97.6	99.1	----------	25	26	17	----------	----------	----------	80	0.9	100
Coleoptera	1	0.8	----------	71	63	6	----------	----------	----------	3	92	0
Cereal	32	59	----------	25	15	12	----------	----------	----------	59	12	2

TABLE 2

Proportion of Important Kinds of Food of the Red-Winged Blackbird. Showing the Percentages of All the Food for Each Month

Group I

	January	February	March	April	May	June	July	August	September	October	November	December
No. Red-winged Blackbirds	4	2	10	15	20	23	1	10	9	11	3	1
Insect food	15	2	13	25	11	16	100	25	8	11	6	1
Vegetable food	85	98	87	75	89	84	0	75	92	89	94	99
Coleoptera	8	1	11	16	17	15	0	5	1	5	6	----
Cereal	46	23	3	4	3	13	0	66	27	27	27	33

Group II

	January	February	March	April	May	June	July	August	September	October	November	December
No. Red-winged Blackbirds	11	7	2	6	16	2	4	12	----	8	4	8
Insect food	9	25	37	19	58	86	96	39	----	2	12	0
Vegetable food	91	75	63	81	42	14	4	61	----	98	88	100
Coleoptera	2	20	21	12	18	71	2	9	----	0.4	7	----
Cereal	16	7	63	11	31	14	0	11	----	22	59	63

Group III

	January	February	March	April	May	June	July	August	September	October	November	December
No. Red-winged Blackbirds	----	----	----	----	7	16	3	----	----	----	----	----
Insect food	----	----	----	----	65	84	55	----	----	----	----	----
Vegetable food	----	----	----	----	35	16	65	----	----	----	----	----
Coleoptera	----	----	----	----	42	38	12	----	----	----	----	----
Cereal	----	----	----	----	33	14	7	----	----	----	----	----

TABLE 3

Shows the Number of Stomachs of Brewer Blackbirds Containing Each Kind of Animal Food, Arranged by Months and by Groups of Counties (I, II and III).

	I.												II.												III.											
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Coleoptera—																																				
Buprestidae																																				
Carabidae	4	1	3		1	4									1		2		2						1			1	1	1						
Cicindelidae																																				
Chrysomelidae	2				3								3	1	1	2			1					2	3				1				1	2	
Coccinellidae														1																						
Curculionidae	4	1	6	6	1						1		3	2	3											1		1	1					1	
Cerambycidae		1																																		
Dytiscidae			1																																	
Elateridae		7	2		2									1	4	1	1																		
Histeridae																												1								
Hydrophilidae																	1																1			
Scarabaeidae			1	1		3										2			1						1			1							3
Silphidae		6			5	1							1	1	2	1																				
Staphylinidae	1		1		1	2	1							1		1			2									1	2							
Tenebrionidae		1		1	1	2			2				1	1	3	1	1	1	1		3					1		3	1	2				2		
Unidentified	1	2	3	1	4	1			2			2	1		1	1	1	1	2					1					1					4	1	
Diptera—																																				
Asilidae																																				
Tachinidae						1																														
Unidentified	4					1							1		1				1						1			1		3					2	1
Hemiptera—																																				
Miridae																			1																	
Scutelleridae			1																																	
Unidentified														1	1																					
Homoptera—																																				
Aphidae															1																					
Jassidae									1		1					1																				
Membracidae																																				
Unidentified			1																																	
Hymenoptera—																																				
Formicidae		5	4	2					4					2	1									3												
Unidentified										1					2										1									4	3	
Lepidoptera (caterpillars)		3	4	1	3					1			1	1	3				1																	

Orthoptera—												
Blattidae												
Gryllidae			1									
Locustidae			1				2	1	3	2	1	
Unidentified				1								
Chilopoda—												
Geophilidae												
Unidentified		1										
Arachnidae												
Insecta (unidentified)						1						
Totals	16	28	29	13	21	16	3	1	12	4	3	2

Orthoptera—												
Blattidae												
Gryllidae	2		2									
Locustidae			1		1		3					
Unidentified												
Chilopoda—												
Geophilidae												
Unidentified			2									
Arachnidae		1	1	1								
Insecta (unidentified)	1			1					1			
Totals	14	13	30	12	7	2	13		4			6

Orthoptera—												
Blattidae												
Gryllidae												
Locustidae						2						
Unidentified						2				1		
Chilopoda—												
Geophilidae												
Unidentified												
Arachnidae												
Insecta (unidentified)												
Totals	7	2		8	8	10				13	9	4

TABLE 4

Shows the Number of Stomachs of Brewer Blackbirds Containing Each Kind of Vegetable Food, Arranged by Months and by Groups of Counties (I, II and III).

	I.												II.												III.											
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Amaranthaceae—																																				
Amaranthus blitoides				1									1		1						2														6	
Amaranthus retroflexus	1	1	1												2						1				1	3										1
Boraginaceae—																																				
Amsinckia sp.																							1		1											
Caryophyllaceae—																																				
Stellaria media		1									1																									
Compositae—																																				
Crepis occidentalis																																				
Hemizonia																																				
Cyperaceae—																																				
Scirpus sp.																																				
Sorghum halepensis																																				
Geraniaceae—													1		1										4				1					1	4	
Erodium cicutarium	3	1	4	13					7	1			5	1	7	4	4				2		1		5	5			1				6	1		
Erodium sp.																																				
Graminaceae—																																				
Barley			1	1																																
Chaetochloa viridis																																				
Echinochloa crusgalli	1								1																										2	
Hordeum sp.																																				
Oat				1	3									4		1					4				5								1	1	8
Panicum capillare																												1					1			
Panicum sp.																																				
Phalaris sp.																					2		6													
Rice																									1	2										
Wheat	9	14	12	14	5			1	12	2	6	4	18	4	4	2							4	6	10	12		1		1			9	8	2
Leguminaceae—																																				
Lupinus sp.																																				

Polygonaceae—																																				
Polygonum lapathifolium																									2											
Polygonum sp.	1	4	3								3	4			2						1		1	4	6	2							1	6	9
Portulacaceae—																																				
Montia sp.																																				
Saxifragaceae—																																				
Ribes sp.																	2				1															1
Tuber																																				
Unidentified (vegetable food)					1		1																													
Totals	15	21	21	30	9		1	1	20	3	10	8	25	9	17	7	6				13		15	10	33	24		1	1	3				22	25	25

TABLE 5

Shows the Number of Stomachs of Red-winged Blackbirds Containing Each Kind of Animal Food, Arranged by Months and by Groups of Counties (I, II and III).

	I.												II.												III.											
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Coleoptera—																																				
Buprestidae						1								1																						
Carabidae				3	2	2		1					1			2	4											1	2	1						
Cicindelidae						1																							2							
Chrysomelidae		1								2				1		1	1	1		1			1					2	1							
Coccinellidae																																				
Curculionidae			8		4	13		1	2		1					1	4			1								1	6	1						
Cerambycidae											1																									
Dytiscidae																													4							
Elateridae	2		2													1						1							4							
Histeridae			1																	3									1							
Hydrophilidae					1									1	1																					
Scarabaeidae				3	1									1			1											1	3							
Silphidae															1	1	1		1									1	1							
Staphylinidae				1	1	3		2						1						4																
Tenebrionidae				5	1	3							1	1				1					1					3	3	1						
Unidentified	3		3	2	4	2		1	1	3	1			2			2	1		1															
Diptera—																																				
Asilidae					1																								2							
Tachinidae																																				
Unidentified			1	1	1	1											1			6								1		2						
Hemiptera—																																				
Miridae																																				
Scutelleridae					1												3																			
Unidentified				1	1	1				1							1			1																
Homoptera—																																				
Aphidae																	1																			
Jassidae			1																										4							
Membracidae																																				
Unidentified																				1																
Hymenoptera—																																				
Formicidae			1		1			1	2	1																			1							
Unidentified										1																										
Lepidoptera (caterpillar)	1		3	1	2	1				3					1		6					1	1							1						

Orthoptera—																																				
Blattidae	1																																			
Gryllidae												1	1			1	1	1																		
Locustidae						1	1	7					1		1		1		3																	
Unidentified																	1																			
Chilopoda—																																				
Geophilidae																1																				
Unidentified																																				
Arachnida				2	1								1																							
Insecta						1																1								1						
Totals	7	1	20	19	22	30	1	12	5	11	3	1	5	8	4	8	28	4	4	18		3	3					10	35	6						

TABLE 6

Shows the Number of Stomachs of Red-winged Blackbirds Containing Each Kind of Vegetable Food, Arranged by Months and by Groups of Counties (I, II and III).

	I.													II.												III.											
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
Amaranthaceae—																																					
Amaranthus blitoides				3		5																															
Amaranthus retroflexus		1	1												2		2	1			1																
Boraginaceae—																																					
Amsinckia sp.						1																	1														
Caryophyllaceae—																																					
Stellaria media				5	2	4																															
Compositae—																																					
Crepis occidentalis																																					
Hemizonia sp.														1																							
Cyperaceae—																																					
Scirpus sp.																																					
Sorghum halepensis	1										1	1																			1						
Datiscaceae—																																					
Datisca glomerata					4																																
Geraniaceae—																																					
Erodium cicutarium			1	2	8	2		4	2	3				2			1	4			5				1					1	1						
Erodium sp.																																					
Graminaceae—																																					
Barley																																					
Chaetochloa viridis																																					
Echinochloa crusgalli	2								5	4											4		1														
Hordeum sp.																					1																
Oat			1											1		1	1	1											2	1							
Panicum capillare																							2														
Panicum sp.						1		1																													
Phalaris sp.																																					
Rice																					5			2													
Wheat	2	1	1	1	3	8		7	3	7	2	1		4	3		1	3	1		1		2		8				2	4	1						
Leguminaceae—																																					
Lupinus sp.			4						1					1																							

Polygonaceae—																																				
Polygonum lapathifolium									1				1																							
Polygonum sp.				1	1			1	1	4		1	4				1		1	3		2	2	3					2	2						
Portulacaceae—																																				
Montia sp.					2	1																														
Saxifragaceae—																																				
Ribes sp.																																				
Tuber																												1								
Unidentified (vegetable food)																																				
Totals	5	2	8	12	20	22		13	13	18	3	3	14	5	1	5	10	1	1	20		8	4	12				5	8	5						

FIRST ANNUAL BLACK SEA BRANT CENSUS IN CALIFORNIA

By James Moffitt

THE BLACK SEA BRANT (*Branta bernicla nigricans*) is a regular winter visitant to the larger bays of California that support a growth of eel grass (*Zostera maritima*). The dependence of brant on the plant for food is so great that the birds never remain on waters where it does not exist for any length of time. Brant are abundant winter visitants to Humboldt, Bodega, Tomales, Drakes and Morro bays on the California coast. Small numbers still occur on Mission Bay, near San Diego, where they were formerly abundant and occasional flocks visit San Francisco Bay, chiefly off Redwood City where they have been observed every spring. Brant are also common winter visitants to the bays and estuaries of the Lower California

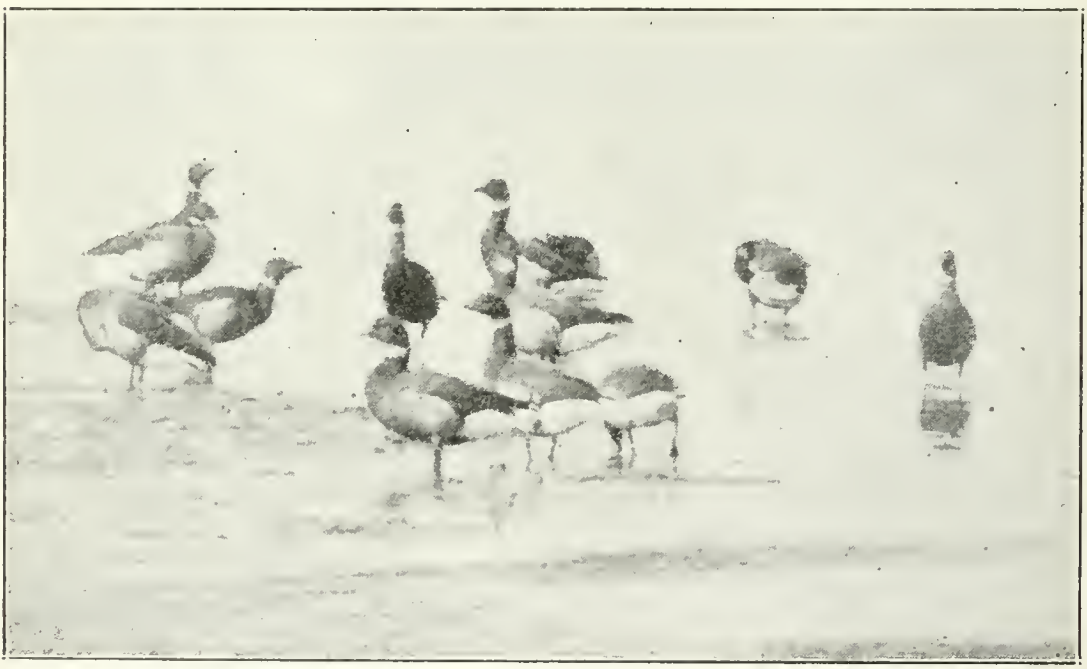


Fig. 104. Black brant resting and preening on sand bar, Tomales Bay, March 12, 1931. Enlarged from motion picture film by E. S. Cheney.

coast where they have been reported in numbers from San Quentin Bay, Scammon, Pond and San Ignacio Lagoons, south to Magdalena Bay. They also winter north on suitable bays along the Oregon and Washington coasts as far as southern British Columbia.

Black brant are extremely northerly nesters and breed along the Arctic Ocean coasts of North America and Siberia. In Alaska they are not known to breed south of the Seward Peninsula. The first approach of winter drives the birds from their breeding grounds in these high latitudes early in the fall. Many black brant nest along the Arctic coast east of Point Barrow to Melville Island and Banks Land. These birds migrate westward in fall past Point Barrow, then southward along the Alaskan coast. This migration commences at Barrow in mid-

August and all have left this point by the end of September. The birds apparently tarry a long while on their southern flight from Barrow to California for they are among the latest migrants to reach our shores. My earliest fall records for Tomales Bay, Marin County, are November 17, 1927, November 11, 1928, and November 10, 1929. The first arrivals here appear to continue on down the coast, probably to Mexico, and the species is never numerous in our waters until late November or early December. Their numbers increase from that time until February when the maximum is reached. The population is about stationary during this month and March, and April finds the northward migration commencing. The birds are slow to depart and though the exodus is at its height in late April, the last birds do not leave until the end of May. Evidently the spring migration is much more hurried than the fall movement for brant arrive on their breeding grounds early in June. There are little data available concerning the migration dates of brant in Lower California; but some claim the birds arrive there in numbers earlier in the fall than they do in our State. This sounds unreasonable; but if true, the increase in numbers of our brant from December to February may be caused by an early northward movement of Lower California birds, rather than by an infiltration of birds from the north as I prefer to believe is the case.

M. Hall McAllister pointed out in his excellent article on this species in the January, 1930, issue of *Associated Sportsmen,* that black brant have held their numbers remarkably well during the past 30 years, whereas the upland species of geese have decreased in abundance alarmingly. This condition has been noted by all familiar with the birds, and though brant are certainly less numerous than they were a quarter century ago, they are comparatively much more abundant than our other geese. This condition is doubtless mainly due to the brant's wariness and maritime habits plus the fact they have not been hunted with live decoys.

I became greatly interested in the sea brant on Tomales Bay in 1927 and commenced a study of them in the fall of that year that is still in progress. Visiting Tomales Bay on November 21 of that year, I found the birds just arriving and only three flocks totalling 40 birds were noted. Henry J. Jensen, a resident of the bay, told me he noted the first brant that fall on November 17 when several hundred birds appeared, to continue on south after a brief stop. January 1, 1928, I estimated between 5000 and 6000 black brant on Tomales Bay and noted the fact that there appeared to be a trifle more birds present than at the same time in 1926 and considerably more than on January 1, 1925.

Commencing in March, 1928, I made monthly censuses of the waterfowl on Tomales Bay whenever possible until May, 1929, in cooperation with the U. S. Bureau of Biological Survey. The area, on account of the long narrow shape of the bay, is almost ideal for census work and the results obtained are certainly 90 per cent correct. The

counts for black brant are provided herewith to show the abundance of the species in different months:

March 11, 1928	3135
April 8, 1928	1837
May 6, 1928	87
September 20, 1928	None
October 13, 1928	None
November 11, 1928	270
December 16, 1928	3087
January 20, 1929	2490
March 24, 1929	6280
April 7, 1929	3271
May 12, 1929	51

In explanation of the fact that nearly twice as many birds were noted in March, 1929, as in 1928, it should be pointed out that the brant spent considerable time on the ocean off Tomales Bay. Further, the birds doubtless fly back and forth between Tomales, Bodega and Drakes bays so in order to get an exact count of the birds in this region, censuses should be made on all three bays and, if practical, on the

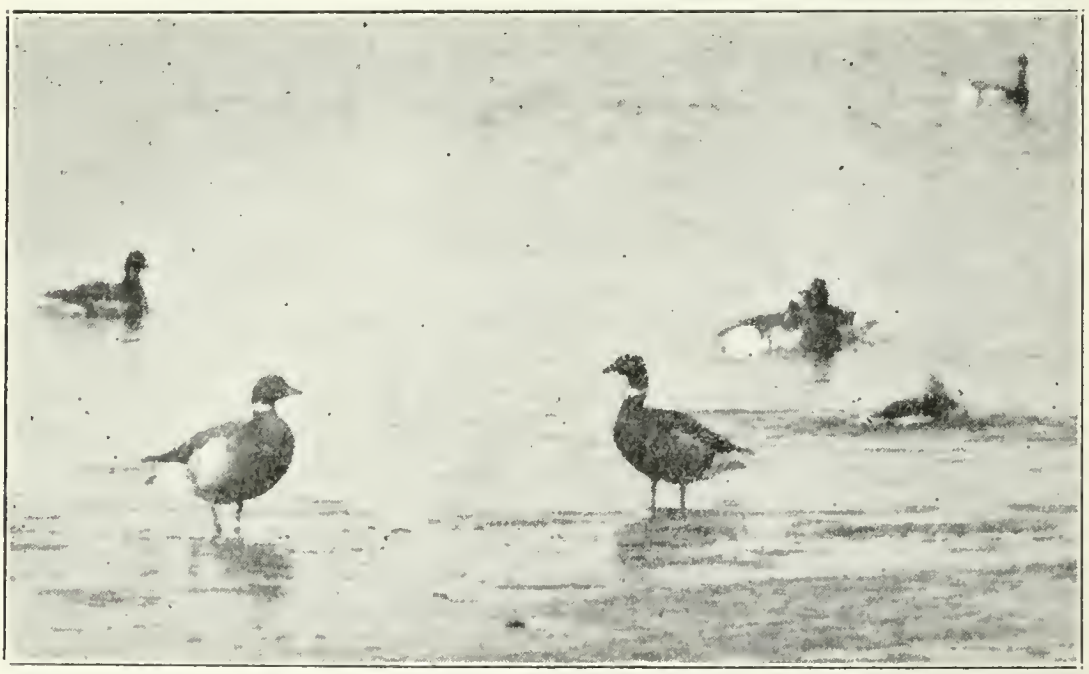


Fig. 105. Black brant on shore and water. Tomales Bay, March 12, 1931. Enlarged from motion picture film by E. S. Cheney.

adjacent ocean too. Weather and tidal conditions greatly affect the number of birds on the bays and ocean. The brant fly in to feed in the bays with an incoming tide and go out to the ocean to roost on ebb tides. If the day be calm and warm, more birds loaf on the ocean than in cloudy or stormy weather when they seek protection in the calmer bays. A large number of the birds spend the night on the ocean, flying from the bays at dusk to return to feed shortly after daylight.

Upon my association with the Division of Fish and Game early this year, I advocated that an annual census of black sea brant be made in California. Leo K. Wilson, Chief of the Bureau of Education and

Research, readily agreed to this suggestion and February 11 and 12 were chosen the dates for the count, when we considered the maximum of the birds would be present on our waters. It is believed that annual censuses, made on the same grounds, on the same date, and if possible by the same observers over a period of years, will provide valuable and interesting information concerning the perpetuation of this species. It is indeed regrettable that it is so difficult to make similar censuses of other game birds; but their wider distribution makes this impractical. Such annual "stock-takings" provide invaluable data for future conservation.

We determined to take censuses on Humboldt, Tomales, Morro and San Diego bays. On account of lack of time to organize cooperators, counts on Bodega and Drakes bays were not attempted, though these areas will probably be included in future censuses. The officials of the San Diego Natural History Museum, through its director Clinton G. Abbott, cooperated in every way and L. M. Huey and F. F. Gander of its staff took the census on San Diego and Mission bays. C. I. Clay and F. J. Smith, of Eureka, kindly volunteered to take the census on Humboldt Bay. Acknowledgment and appreciation of these gentlemen's cooperation is hereby made. L. K. Wilson and I took the census on Morrow Bay and I made the count on Tomales Bay.

The results of the censuses are tabulated below:

Locality	Date	Time	Observer	Number of birds
Humboldt Bay	Feb. 6, 7, 8	——	F. J. Smith	4,100
Humboldt Bay	Feb. 11, 12	All day	C. I. Clay	500,000
Tomales Bay	Feb. 12	8:00 a.m.—3:00 p.m.	James Moffitt	9,445
Morro Bay	Feb. 10	3:00 p.m.—5:30 p.m.	L. K. Wilson and James Moffitt	4,493
Mission Bay	Feb. 12	"Low tide"	L. M. Huey and F. F. Gander	71
San Diego Bay	Feb. 12	"Low tide"	L. M. Huey and F. F. Gander	none



Fig. 106. Black brant feeding and preening. Immature gulls in right foreground. Tomales Bay, March 12, 1931. Enlarged from motion picture film by E. S. Cheney.

A great discrepancy will be noted between Mr. Smith's and Mr. Clay's figures for Humboldt Bay. This might be explained by a sudden influx of large numbers of brant between February 8 and 11, or more probably by the fact that the main body of birds may have been resting on the ocean when Mr. Smith made his counts and on the bay when Mr. Clay observed them.

Mr. Smith advises the results of his counts by letter on February 10, stating he observed 1100 brant on North Humboldt Bay, near Mad River Slough, February 6, and the same number of birds north of Bird Island, February 7. On February 8, this observer counted 3070 brant on South Humboldt Bay, noting large flocks estimated at 1000 birds each near Hookton and the Peninsula and smaller flocks near Fields Landing and the "dyke." He wrote that the small bunches of brant flew around greatly and that he judged approximately 3000 birds for South Bay and 1100 for North Bay would be correct figures.

C. I. Clay wrote as follows on February 12:

"Your letter of January 29 is at hand; requesting information on wintering grounds of *Branta nigricans,* a census on Humboldt Bay February 11 and 12, 1931.

"On both dates mentioned above, I scanned the north bay from Arcata to Samoa and along all channels without seeing a single bird. *Branta nigricans.* If any were there, they must needs be but a few isolated specimens.

"On the south bay, between Fields Landing and the Table Bluff ridge, peninsula triangle, things were entirely different. At high water during the day, there were so many brant I will not venture a count. The entire South Bay was a black and white checkerboard, so to speak, with *Branta nigricans.* Literally their numbers must total many thousands, there being miles of them all in a solid mass.

"These birds winter on the South Bay and often light in massed flocks on the ocean, directly west of the bay. I could not observe the ocean from my position the past two days.

"The two days were calm of wind, clear sunshine till late afternoons, when cirro-stratus clouds set in."

I wrote Mr. Clay on February 16 requesting his estimate of the number of brant he noted on South Humboldt Bay February 11 and 12. His kind reply of the 22nd is quoted as follows:

"As you are asking me to give you an approximation of the numbers seen on South Bay, I will venture a count upon second thought, for I have since roughly checked the acreage of brant covered waters and will advisedly state the number of birds estimated, to my own belief, is way short of the actual *Branta nigricans* population of the great South Bay on February 11 and 12, 1931.

"500,000 squawking, floating, black and white, feathered bird forms in the background, where the space between individuals seemed a mater of shadowed waters, gradually closing in perspective with receding distance, till water and birds seemed one homogeneous mass of moving life, only to be broken by distant stretches of bleached sand dunes as vision reached the barrier between bay and ocean."

It is apparent that there were tremendous numbers of black brant on Humboldt Bay when Mr. Clay made his count, and though his figure of half a million birds seems almost incredible, his graphic description

of their number conveys the impression of the magnitude of this concentration.

The counts for the other localities are considered to be at least 90 per cent correct. The census commenced at Morro Bay at 3:00 p.m., February 10, at approximately low tide. All the brant in the vicinity were apparently in the bay, feeding on the incoming tide while the count was being made. Most of the birds were grouped along the southeast corner of the bay. At dusk they rose, to fly out to the ocean to roost for the night. A tremendous number of brant were found on Tomales Bay when the census was taken there February 12. The count secured was the highest of twelve censuses taken at this point by me and exceeded my highest previous count, 6280 birds on March 24, 1929 by more than 3000 birds. Most of the brant were in the bay opposite Hamlet and a satisfactory count was secured.

It is apparent that brant are abundant winter visitants to the localities in California mentioned in this paper and their numbers appear to have increased somewhat in the past few years. Annual censuses of the present character over a period of years should definitely establish their future status.

NORTHWARD OCCURRENCE OF SOUTHERN FISH OFF SAN PEDRO IN 1931

By Lionel A. Walford

DURING THE WINTER of 1930–1931, and the spring and summer of 1931, unusually warm weather has prevailed along the southern California coast. Figure 1 shows the deviations from the average air temperatures since July, 1930, which probably correlate closely with the ocean temperatures for the same period. That these high temperatures have been accompanied by an unusual appearance of tropical fish in the waters of southern California has been indicated by the number of southern fish brought to California State Fisheries Laboratory for identification.

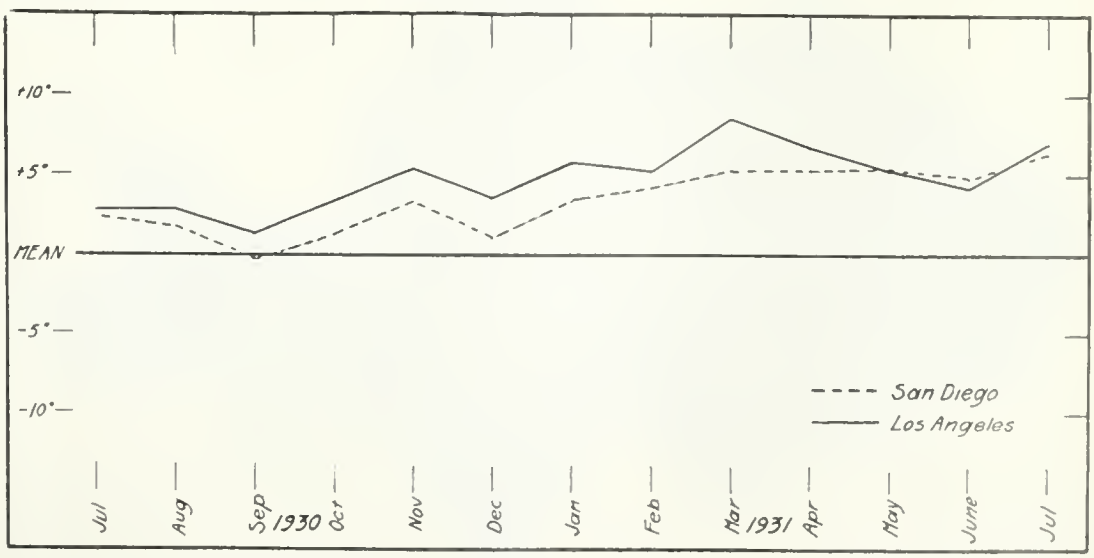


Fig. 107. Air temperatures in southern California have been above normal since September, 1930. The graph shows the deviations from the average monthly temperature.

A rather large number of the sharp-nosed flying fish, *Fodiator acutus,* was taken at various times during the month of June by round haul fishermen. This fish, which has evidently not been noted from as far north as San Pedro before, is recorded from the Gulf of California southward to Panama on the Pacific side, as well as in the tropical Atlantic and from southern France. It is considerably smaller than the California flying fish, scarcely exceeding seven inches in length. It differs from ours in having a pointed lower jaw, a much higher dorsal fin, and a pectoral fin which does not reach past the dorsal fin. Its color is dark greenish blue on the back, growing abruptly silvery at the side, an opalescent violet band about the width of the eye extending along the lower part of the side. The lining of the mouth is a beautiful peacock blue.



Fig. 108. Sharp-nose flying fish, *Fodiator acutus.* Photo by Richard S. Croker.

A large triggerfish, *Balistes polylepis,* was taken off San Pedro in March, and another in July by round haul fishermen. This fish has been recorded from San Diego to Panama, but it is a rare visitor as far north as Los Angeles County. It is easily recognized by the very hard



Fig. 109. Triggerfish, *Balistes polylepis.* Photo by Richard S. Croker.

skin and the small gill opening with the plate-like scales behind. The color is grayish brown, the scales tipped with blue. The name triggerfish is derived apparently from some fancied analogy to the ability of the fish to lock the large spine of the first dorsal fin so that it is immovable, and to unlock it at will.

A spadefish, *Chaetodipterus zonatus,* was taken off San Pedro during May. The usual range of this fish is from San Diego to Panama, and so far as we know, it has not been reported as far north as San

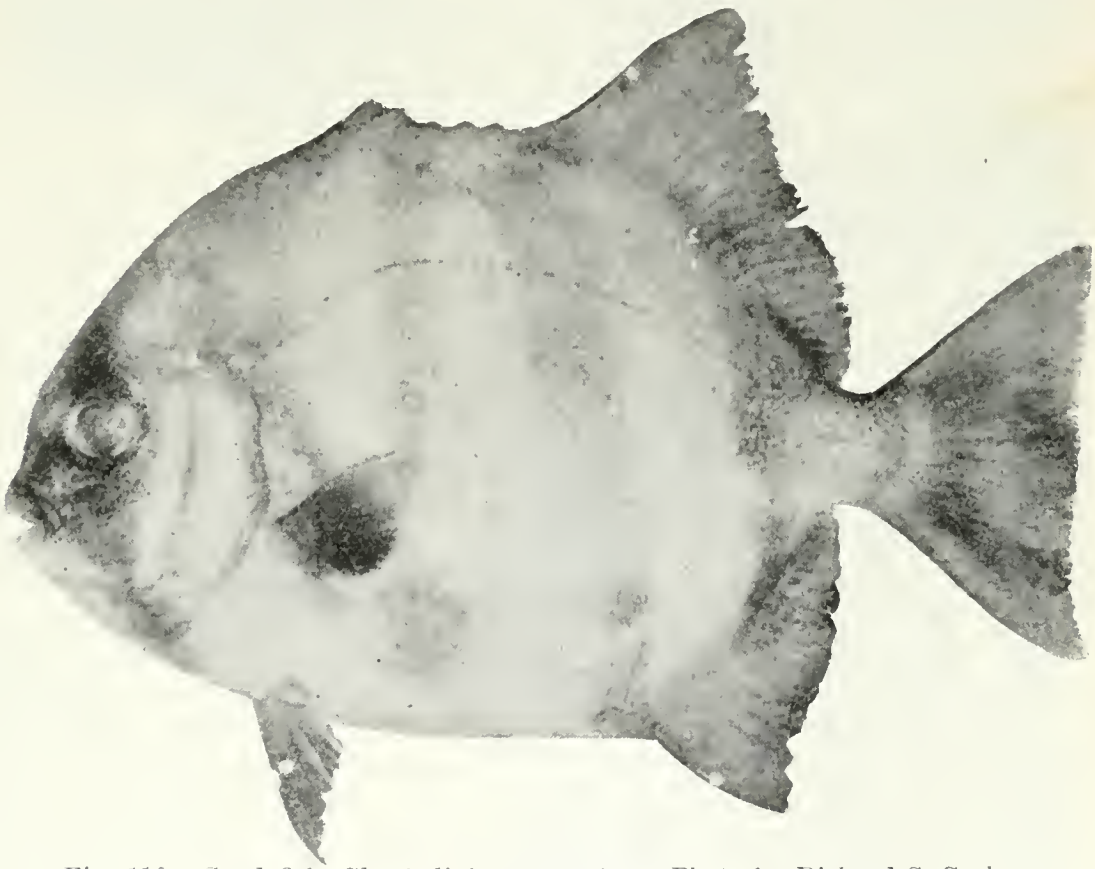


Fig. 110. Spadefish, *Chaetodipterus zonatus.* Photo by Richard S. Croker.

Pedro before. The color is grayish silvery with blackish cross bands as shown in the photograph.

Several Japanese herring, *Etrumeus micropus,* a rather rare visitor to this region, were seen in the markets this year. These were large specimens, around 14 inches long, apparently sexually mature.

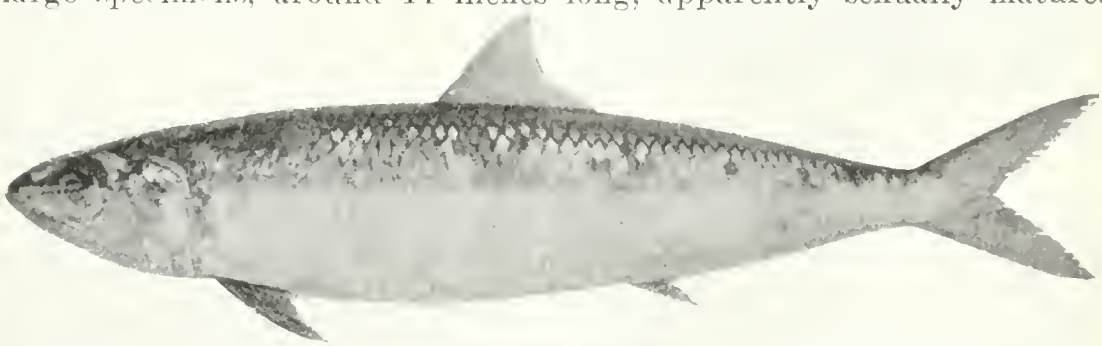


Fig. 111. Japanese herring, *Etrumeus micropus.* Photo by Richard S. Croker.

These fish are found also in Japan and Hawaii, where they are much commoner than they are here, being the principal food fish of the northern part of the Japanese Empire. They differ from our other

herring-like fishes in having the ventral fins attached entirely behind the dorsal fin.

A hammerhead shark, *Sphyrna zygaena*, was landed at San Pedro in July, and another at Santa Monica. This curious fish is taken occasionally off San Diego, but is rarely landed farther north, possibly because there is no factory utilizing sharks in Los Angeles or Orange counties, but also possibly because these places are out of its range. The last time the writer saw hammerheads in San Pedro markets was in 1926, another year of unusually warm weather.* These sharks are easily recognized by the sideward extension of the head to form a hammerlike structure, the eyes being on the ends of these extensions. Small specimens are rarely if ever seen in these parts, the one landed in San Pedro being about nine feet long.



Fig. 112. Manta delivered to San Pedro, July 27, 1931. This specimen measured fourteen feet across. Photo by D. H. Fry, Jr.

The most remarkable catch of the year, given publicity all over the country from coast to coast, was that of the giant ray, *Manta birostris*, landed at San Pedro. Another specimen was seen off the fishing barge at Avalon, and another off Santa Cruz Islands. This fish, recorded from San Diego southward on the Pacific coast, and from New Jersey southward on the Atlantic, has probably never been seen on the Pacific side as far north as San Pedro. They are easily recognized by the two fleshy appendages on the head, which look like horns and which give to the fish the grotesque name "devilfish." A more acceptable and exact name, however, and that used by the California Division of Fish and Game, is "manta." These appendages are used in feeding, as hands, the fish moving slowly through a school of small fish, turning from side to side, constantly moving these head appendages to fan the small fish into the mouth. Although mantas grow to a great size, attaining a width of twenty-five feet or more, they have been frequently observed to leap almost clear out of the water. The specimen taken at San Pedro was fourteen feet across, and weighed about a ton.

* Hubbs, Carl L., and Schultz, Leonard P. The northward occurrence of southern forms of marine life along the Pacific coast in 1926. California Fish and Game, 1929, vol. 15, pp. 234–241.

Attached to the manta was the largest remora we have seen—thirty-four inches long. These fish have a curious sucking disc on the top of their heads, which enables them to stick to the sides, or even to the walls of the gill chambers of large sharks and rays. They ride along with their host, sharing his food and enjoying immunity from being eaten themselves.

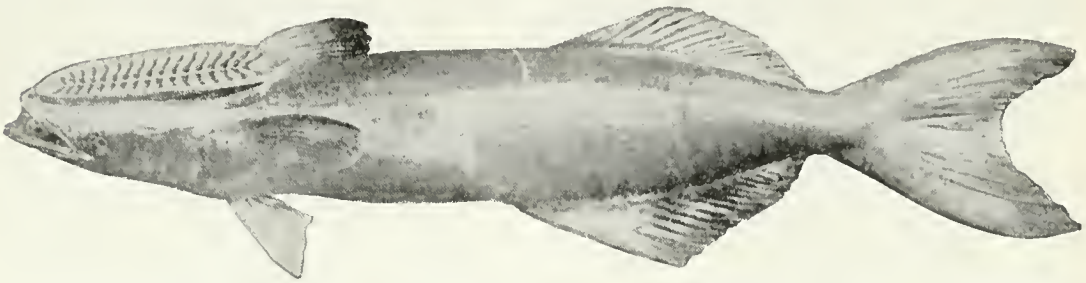


Fig. 113. Fourteen-pound remora, which was attached to the manta. Photo by D. H. Fry, Jr.

It will be interesting to hear whether people from other points along the coast have observed this unusual movement of marine life, of invertebrates as well as of fish. Hubbs and Schultz* have recorded such a phenomenon for 1926. Perhaps at the close of the year a similar record may be available for 1931.

A REVIEW OF NEW PUBLICATIONS ON CALIFORNIA FISHERIES

THE California Bureau of Commercial Fisheries has recently issued four new publications, Fish Bulletins 28–31, for which there is an unusual demand by persons engaged in the fishing industries, by scientists, and by the general public.

Copies of any of these interesting booklets may be obtained free of charge from the California State Fisheries Laboratory, Terminal Island, California.

A review of these bulletins is given below:

Handbook of Common Commercial and Game Fishes of California.

Fish Bulletin 28, "Handbook of Common Commercial and Game Fishes of California," by Lionel A. Walford is an illustrated booklet making a splendid reference for the easy identification of about one hundred and thirty of the common species of fishes found in the waters of this state. The book is not written for fisheries scientists, but is intended for use by commercial fishermen, anglers, fish dealers, housewives and the citizens interested in our fisheries resources.

The chief purpose in preparing this bulletin in the first place was to bring order out of the chaos of common names used for fishes. Confusion in the past arose through using several names for the same species and again in applying the same name to two or more dissimilar fishes. This was an annoyance to anglers, caused difficulties in the sales departments of fish dealers, especially in filling out-of-the-State orders and in addition, the loose use of names endangered the accuracy of the State's

* *Loc. cit.*

records of the commercial catch. These records form the basis of the conservation program of the Bureau of Commercial Fisheries, and are used not only in administering the activities of the Bureau, but also serve as the foundation for most of the research work which has proven of such worth in determining the effects of man's fishing upon our fish supply. As provided by law, the Bureau of Commercial Fisheries published in this bulletin an official list of common names so that each fish might have one, and only one, name, and it is gratifying to note the ready response of the trade in applying these official names in their bookkeeping systems.

Anyone using the book has little trouble in identifying the fish under discussion, as a clear photograph of the fish appears at the top of each page. Directly under the photograph the official name is printed in bold-faced type with the scientific name below it in small italics. The text at the bottom of the page serves the double purpose of further identifying the species and giving briefly some interesting information concerning the particular fish illustrated above. For each species the family name is given and other close relatives in local waters are mentioned. The distinguishing characters by which the fish may be readily recognized are given so that the reader need not confuse two species similar in appearance. This is followed by statements as to the occurrence and distribution of the fish with notes on the seasonal runs, commercial and angling importance, and the gear most frequently used in the fishery.

Anyone wishing to identify a fish by the use of a key will find at the front of the book a very simple and easily used key in which technical language has been omitted whenever possible. A glossary and drawings define the anatomical terms used. At the back of the book there is a glossary of the names of fishing gear and an article describing the meaning and use of the scientific or Latin names of animals.

For many years there has been a great necessity for such a handbook, and Bulletin 28 is a very creditable response to the need for a simple and easily used manual.

The Striped Bass of California.

There are not very many fishery problems which have yielded such useful and satisfying results as the striped bass investigation conducted by the Bureau of Commercial Fisheries and completed this year with the publication of "The Striped Bass of California," by Eugene C. Scofield. A first report, "An Analysis of the Catch Statistics of the Striped Bass Fishery of California," by J. A. Craig, was a study and evaluation of the relative abundance of this fish. From it we know fairly definitely that the striped bass population is not at present in danger of depletion. If any future catch analysis should show a depleted population, one can intelligently devise legislation on the basis of a knowledge of the life history. Scofield's paper adequately provides this basis.

The first part of the book presents a picture of the striped bass fishery of California. The description, care and operation of fishing gear, as well as the handling and sale of the catch are here described in readable, nontechnical style.

"The Life History of the Striped Bass," which is Part II of Scofield's report is of a more technical nature than the first section. Life

history studies can concern themselves with any number of questions, many of which would be of more popular interest, but of less actual value to sportsmen and commercial men than the problem to which Scofield has confined his work. We learn that bass grow rapidly during the first year, gradually less rapidly during succeeding years. In their fourth year, 35 per cent of the female spawn; in their fifth year, 87 per cent; and in their sixth year, practically all. Many of the males spawn in their third year, more in their fourth, and all in their fifth. Spawning takes place in both fresh and brackish water of the region adjacent to Suisun Bay, and many miles up the Sacramento and San Joaquin river country. Each female has one spawning period each year, producing then from 500,000 to 2,500,000 eggs. Other phases of the life history also are discussed, such as migrations, racial composition and food of the bass.

Part III applies the findings of Parts I and II to the commercial catch. The effect of commercial fishing on the population is discussed in some detail. The principal conclusion drawn here is that because of the size of mesh in the nets, the commercial catch is made up mostly of from five to six-year-old fish. The paper closes with a review of legislative measures designed to protect the bass, and sets forth recommendations for a future policy. Aside from their value to the California legislative body, and for their scientific interest, the striped bass reports should provide a satisfactory check on enthusiasts who believe the bass population doomed, and who, from observations made on a few fishing trips, make overhasty conclusions, and agitate for drastic, often poorly planned laws. To these people, Longfellow's famous line is appropriate, "For things are not what they seem."

The Commercial Fish Catch of California for the Year 1929.

Third in an annual series of publications on the commercial fisheries designed in an effort to present a popular version of the State's catch statistics, Fish Bulletin 30, "The Commercial Fish Catch of California for the Year 1929," has just come from the press. From an historical as well as a statistical viewpoint these bulletins are increasing in value and interest with each succeeding year. It is regrettable that this one, the data for which were compiled and ready for publication over a year ago, could not have reached the public at an earlier date. New phases of the commercial fisheries statistics have been presented in this bulletin. Records which have a direct bearing on the catch, such as statistical data on the fishing boats, and estimated values of the marine products have been given.

Tables and figures are provided for mathematicians. Charts and graphs bring out the highlights in these somber statistics, thus giving a bird's-eye view for the hurried reader of the rise and fall of the important species. Finally as a new innovation in the series, well-chosen photographs illustrate the salient points in the main articles, which give past as well as current information.

Of particular interest among the articles on the general welfare of the State's marine resources is one by Mr. C. B. Tendick, Agent of the United States Bureau of Fisheries, entitled "The Value of the Commercial Fishery Products in California." The California State Fisheries Laboratory staff members have given individual species attention from the following angles: California sardine landings have been

compared with those of five foreign nations. The reasons for and the results of the expansion of the tuna fishing areas are given. The skyrocketing in the last few years of the mackerel with its more recent inclination to fall off is explained. Interesting facts are brought out about what is being done by the three Pacific coast states and the two governments concerned with our fast disappearing salmon. The romance of the Alaska codfish fishery, which directly concerns California since the bulk of it is cured and marketed from this State, will interest the old-timers. Both sportsmen and the commercial fishing interests will find that the story of the yellowtail, and that of the cabrilla from Mexico which is fast coming into the limelight, contain food for thought. Abalone, although of lesser commercial importance, is nevertheless of much interest to the general public. A review of the operations in the abalone fisheries of both California and Mexico should meet with approval.

Directly influencing the commercial catch, developing new grounds and in turn being developed themselves to suit the needs of the fisheries, the fishing craft have been featured in this bulletin. The census of the fishing boats covers the individual fishing regions as well as the entire State, and excellent photographs of at least fifteen of the different types of fishing boats lend interest to the statistical record.

Studies of the Length Frequencies of the California Sardine.

That the sizes of sardines caught by the California fishermen vary from year to year is demonstrated in Fish Bulletin 31, "Studies of the Length Frequencies of the California Sardine," recently issued by the California State Fisheries Laboratory. This bulletin contains two articles, "Dominant Size-Groups and Their Influence in the Fishery for the California Sardine," by Frances N. Clark, and "The Commercial Catch of Adult California Sardines at San Diego," by H. C. Godsil.

The chief cause of the change in size of fish in the catch is the presence of dominant groups. This dominance is presumably brought about by favorable environmental conditions in certain seasons which result in an unusually large number of fish surviving through the first year. When a superabundant group first enters the commercial catch the average size of fish in the catch is small, and as the individuals of the dominant group increase in size from year to year the average shows a corresponding increase. This increase of the average size of the fish is accompanied by a decrease in the numbers of fish packed in a "pound-oval" can.

The same dominant groups have appeared at Monterey and San Pedro and passed through the fishery at each port in a similar manner. The fishery at San Diego for pound-ovals is much more restricted than at Monterey or San Pedro, but the data indicate that the same superabundant groups are present in the San Diego fishery also.

The behavior of three dominant groups which passed through the California fishery between 1919 and 1930 is used as a basis for the prediction of the fate of the superabundant class which entered the fishery in 1929–1930. This group should influence the fishery until 1933-1934, causing small fish to dominate the catch in 1930–1931 and increasingly larger fish in succeeding years. The catch for 1930–1931 at both Monterey and San Pedro was comprised of the predicted sizes and the accuracy of the later predictions will be awaited with interest.

SACRAMENTO PERCH

By George Neale

(With three photographs by author)

THE SACRAMENTO PERCH (*Archoplites interruptus*) is but little known or even recognized by the younger generation of anglers. Dr. David Starr Jordan says, "It is a large and gamy fish, valued and interesting as being the only fresh water fish of the nature of perch or bass, native to the west of the Rocky Mountains." It is said that their numbers have been greatly reduced by the perch eating the catfish and their stomachs being torn by the sharp pectoral fins. To some extent, this may be true, but it is the opinion of the writer, who has known these fish intimately for more than forty years, that the depletion is caused by the catfish and carp eating the spawn of the perch.

I have made some interesting experiments with the egg of spawn-eating fishes. Of course all the experiments have been made in an



Fig. 114. Sacramento perch recently rescued from Lake Chabot were planted in this fine propagating pond near Sacramento. Picture shows north end of lake.

aquarium and those fish which ate may have been forced by hunger to do so. The black basses and crappies will starve before they will eat spawn, but it has been demonstrated that carp, catfish and bluegill will eat the spawn.

The spawning habits of the Sacramento perch are unlike the black bass, which prepare their nest on the sand or mud at the bottom. This particular perch spawns among the aquatic growth, old limbs of trees and branches sunk in the water. My experience with these fish is that they are less aggressive and pugnacious at the spawning time in protecting their spawn and young than are the bass and some others of the spiny-rayed tribe of fresh-water fish. Consequently, the spawn is more or less unprotected during the spawning period.

Before the introduction of the carp and catfish into our waters, and in spite of the fact that many tons of Sacramento perch were netted and marketed every year, they more than held their own, and, strange as it may sound, were, with the exception of the salmon and trout, the only game fish in our valley waters. In the year 1890 or before, the introduced fishes became numerous, Tulare Lake in Kings County, Duck, Prospect and Sycamore sloughs, in Yolo County, Butte Creek and many other waters of Sutter County were thickly populated with them.

The Bureau of Fish Rescue recently rescued 200 Sacramento perch from Lake Chabot. These fish averaged from two and one-half to four pounds each in weight. They were all transported, alive, to Sacramento, where two fine lakes donated by a friend were prepared for them. It is the intention of W. H. Shebley, in charge of the Bureau of Fish Culture, and the writer to propagate them and to endeavor to rehabilitate them by stocking waters that do not contain spawn-eating fish. In 1910, the writer and Deputy M. L. Cross were instructed by the Fish and Game Commission to make distribution of black bass from Lake Chabot. This we did, making, in all, 240 shipments from Los Angeles to Siskiyou. The only fish netted in the lake were black bass and Sacramento perch. No other fish were present. In our rescue work last July, there were no other fish present except Gambusia or mosquito minnow. This accounts for the perch being so numerous, for the reason that black bass do not prey upon spawn, but will eat the young of most any species, including its own. Examination of the stomach contents of both bass and perch showed nothing but small Gambusia, both of the other species being too large for them to swallow. We also learned that a large majority of the perch had not yet spawned. It is possible that we may raise a large number this season. They are now perfectly contented in their new home, with their diet of Gambusia, with which they are being fed. Naturally, they are a river or stream fish, but with the era of hydraulic mining filling the rivers with silt, their last chance to exist is in the inland lakes, of which there are many.

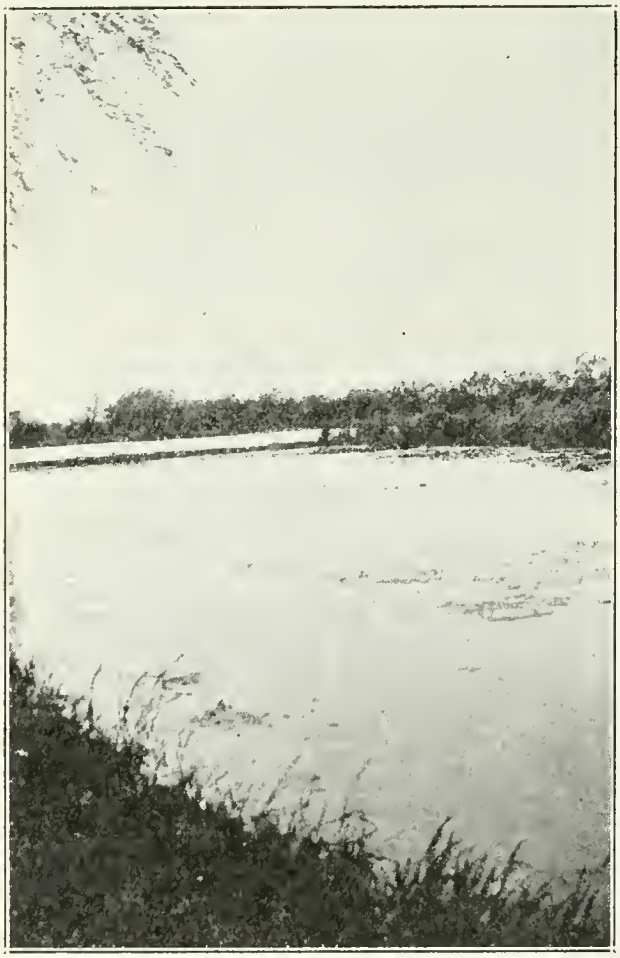


Fig. 115. South end of perch propagating pond near Sacramento. Note the levee dividing the middle pond.

For table use, they are the peer of all the spiny-rayed tribe of fishes.

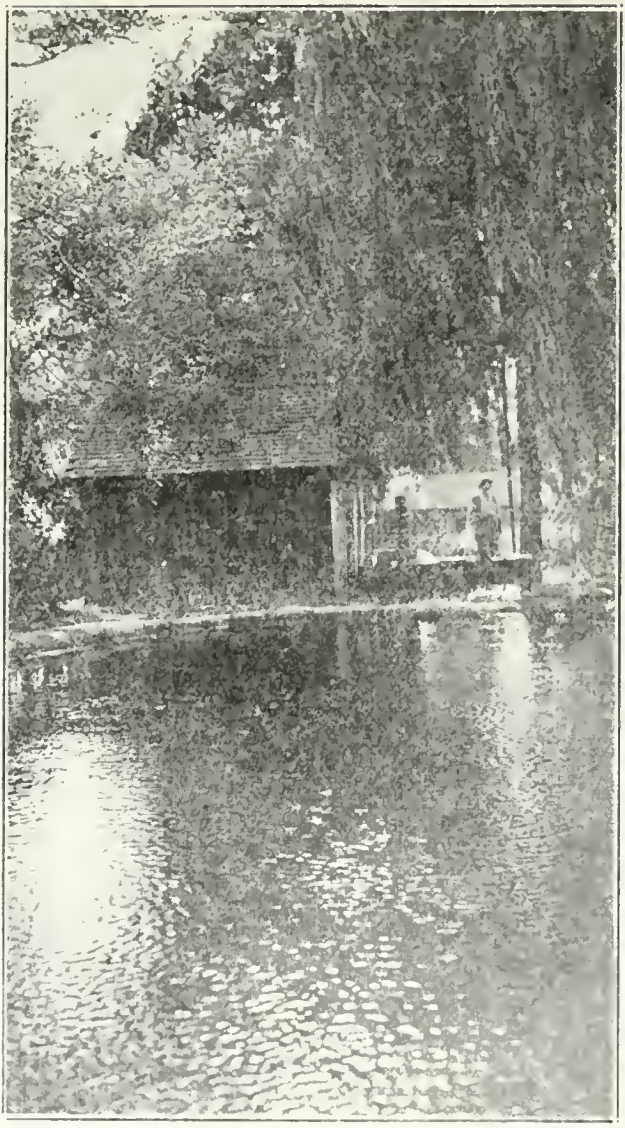


Fig. 116. A fine six-inch stream of water, 60 degrees in temperature, feeds all three perch propagating ponds near Sacramento. Mrs. George Neale is standing by the cement inlet trough. The water is very clear.

SOME PROTECTED BIRDS THE DUCK HUNTER SHOULD KNOW

By James Moffitt

THIS article has been prepared for the duck hunter to draw his attention to some protected birds he should avoid shooting and to assist him in identifying these species in life. All of the birds treated here are especially protected by State or Federal laws, or by both, on account of their scarcity. Many of them are innocently or wantonly killed each gunning season by hunters who are either uninformed or heedless of their protection.

White-tailed Kite (*Elanus leucurus majusculus*). This beautiful hawk was once abundant over most California lowlands, but its numbers were severely reduced even forty years ago, chiefly by wanton shooting. It is a handsome and conspicuous bird with gentle or trustful habits which accounted for its depletion. Marshes are favorite feeding grounds for kites and they ordinarily pursue their food, mice and insects, by harrying back and forth over such areas. They usually fly at low elevations and thus afford conspicuous targets to hunters who occasionally try their aim at them when better prey is scarce. This habit was no doubt the greatest contributing factor to their almost extinction 25 years ago. The white-tailed kite was given absolute protection in California in 1905, which it has since enjoyed even to the extent that scientific collectors are not permitted to take it or its eggs. Despite this protection, the birds have, at best, been slow to respond and they are now but fairly numerous in favored localities where originally abundant. No doubt the main reason kites have not increased more rapidly is the fact that some are still killed each shooting season by thoughtless sportsmen.

It is indeed a pity to kill this unique and beautiful bird. In addition to being a most interesting member of our avifauna, the kite is one of our most beneficial species. Some hawks that are generally considered beneficial occasionally prey on other species considered friendly to man's interests, but are classed as beneficial because the majority of their prey consists of harmful varieties. Not so with the kite. I know of no smudge against its bill of fare which appears to consist wholly of species inimical to man's interests. Its diet is made up of mice, lizards, crickets, grasshoppers and other similar pests.

The white-tailed kite, a member of the hawk family, is a slender bodied, long-winged bird some 16 to 17 inches in length. More often seen in flight than at rest, it sails so lightly on its long wings, it resembles a sea gull more than a hawk. Its upper plumage is deep pearl gray in the adult, paling on the head and toward the tail, which is white except for the two central gray feathers. The wings are deep pearl-gray above, except for large, black shoulder patches. Beneath they are white out to the "elbow" where characteristic black spots or "mirrors" exist. The primary flight feathers, forming the tips of the

wings are gray. The bill proper is black, but the basal skin is yellow as are the feet and legs.

Donald D. McLean, field naturalist of the Bureau of Game Refuges, has prepared some pencil sketches showing characteristic attitudes of the white-tailed kite that are reproduced herewith. Fig. 117A shows a ventral aspect of the bird as it appears when sailing overhead. The



Fig. 117. Pencil sketches of the white-tailed kite. A, soaring flight; B, hovering pose; C, perched at rest. Drawings by D. D. McLean.

rounded white tail, clear white under surface and the black "mirror" near the bend of the wings are characters to identify it.

Fig. 117B shows the bird in the characteristic hovering pose. This attitude is distinctive of the species. Kites sail over marshes as pictured in Fig. 117A in search of food. When favored localities are reached the birds check their flight by hovering with highly arched wings, which are flapped rapidly, holding them almost or quite stationary in the air while they inspect the ground below for food. The hovering ordinarily occurs about 60 feet above the ground, but may vary from 25 to 100 feet elevation. If prey is located, kites descend vertically, at moderate speed, with wings still highly arched but rigid, to seize their victims. Anyone doubting the nature of kites' food need only note their small, weak feet and legs, which are obviously unsuited to cope with anything but the smallest prey.

Fig. 117C shows a kite at rest. The birds are not often seen in this pose by the hunters as they are more frequently awing, when on the marshes. They do, however, occasionally rest on the tops of such trees as may grow in the vicinity, on posts, or even on high tule. I have seen as many as 11 at rest in a group on thick tule.

The only bird a hunter might reasonably confuse with a white-tailed kite is the adult male marsh hawk. The latter is, however, a larger species measuring from 17½ to 20 inches in length. It frequents marshes like the kite but does not indulge in the hovering flight of the former. The male marsh hawk is blue-gray above and mixed white and reddish below. It shows some gray on the underside of the neck and chest and is altogether a darker appearing bird than the kite. It has a much longer, slimmer tail than the kite and its wings are rounder and more upturned at their points. This species usually flies closer to the ground than kites and glides over the marshes with frequent turns and dips. Young male and female marsh hawks of all ages, are mainly brown in plumage, except for a conspicuous white patch at the upper base of the tail, and can not be confused with kites in any plumage. In any event, marsh hawks are protected in California and may not be killed legally. Therefore the duck hunter has no excuse to offer when he claims he thought the kite he shot was a marsh hawk.

The duck hawk is the only hawk a hunter is likely to see on our marshes that he may kill legally. It is a relatively rare species in California and certainly few are killed in proportion to the beneficial hawks that hunters destroy, many perhaps in the belief they are duck hawks simply because they are found on marshes. The duck hawk can usually be recognized by its extremely swift flight, accomplished by vibrating its sharply pointed wings very rapidly, through a short stroke. In size it resembles the marsh hawk, though it is of heavier build throughout. Its plumage is mainly dark brown, with lighter, freckled undersurface. Old birds are dark bluish-gray above. Cooper and sharp-shinned hawks, the only other members of the family that are considered predacious and may be legally killed in California at any time are usually confined to forest or brush lands and are seldom found on our marshes.

Wood Duck (*Lampronessa sponsa*). Most duck hunters are aware that this beautiful bird is protected by both Federal and State laws at

all times and few if any would knowingly kill it. The gaily colored plumage of the male wood duck is so conspicuous and well known to practically all sportsmen that a description of it seems unnecessary. A photograph of a mounted specimen was reproduced in the October, 1930, number of California Fish and Game (Vol. 16, p. 341).

It is more difficult to distinguish the female wood duck from certain other species and some are killed each shooting season by hunters who fail to identify them until too late. Like most ducks, the female of this species wears much duller plumage than the male and is mostly plain brown in color. At close range, the brown crested head with ring of white feathers surrounding the eye and the white throat patch are good marks for identification. However, the hunter will frequently not have close enough view of the wood duck to note these features and will probably most often encounter it in flight. Here, particularly when viewed from below, rather than from the side when the crest can be noted, the bird may resemble the females of the widgeon (baldpate) or the gadwall. The females of these three ducks are about the same size and are the only female fresh water ducks occurring in California that have clear white underparts. Both the female widgeon and gadwall have white bars on their wings that show conspicuously in flight while the female wood duck's wings are entirely dark in color. The white "speculum" (mid wing patch) of the female gadwall plus its orange-yellow feet and legs and general "mallard-like" appearance, serve to distinguish this rather scarce California duck from the wood duck, which has dull yellow, almost brown feet and legs. The female widgeon has an almost pure white underwing surface that is very conspicuous in flight. Therefore, in order to be on the safe side, a hunter should not shoot a medium-sized, plain brown duck with pure white underparts, unless it shows white on its wings in flight. Another distinctive feature of the female wood duck is its long rounded tail which appears to be twice as large as that of either the gadwall or widgeon.

Perhaps the best recognition mark of all for the female wood duck is its habit of calling characteristically in flight. When startled or flushed it usually utters a high-pitched quavering *hoe-eek* or *oe-eek* which is frequently repeated in flight. No other ducks render a similar call.

There are certain localities where hunters should be particularly watchful for wood ducks. This species is usually found where trees are growing adjacent to water. Willow and cottonwood bordered sloughs in the interior valleys are favorite haunts of this bird. It also frequents creeks, streams or lakes that are margined by oaks and is often found perched in oak trees where acorns form a favored food for it. Wood ducks do not ordinarily frequent open marshes or ponds where hunters need not be apprehensive over accidentally killing them; but sportsmen who are shooting near trees, often favorite spots for mallard, should ever be watchful for this species.

Ross Goose (*Exanthemops rossi*). This and the following species were accorded complete protection in the United States by amendment to the Federal Migratory Bird Treaty Act on March 17, 1931. The Ross goose, also termed Ross snow goose and sometimes China brant, is the only North American bird whose breeding range is entirely unknown. It nests somewhere in the extensive Arctic lands north of

the Athabaska-Mackenzie region of Canada through which it travels each spring and fall migration. Its winter range lies almost wholly within California where it is chiefly found in the Sacramento and San Joaquin valleys. Ross geese were originally abundant winter visitants to our central valleys, but have always been far less numerous than the larger lesser snow geese. Like other geese, Ross geese were greatly reduced in numbers by market hunting before this became illegal and they are now comparatively scarce. In order to preserve this unique bird, it was given complete protection and since almost all Ross geese winter in California, it is up to us to see that the species is perpetuated.

The Ross goose is one of our smallest geese, adults varying from 22 to 26 inches in length from bill to tail-tips, and weigh from $2\frac{1}{2}$ to $3\frac{3}{4}$

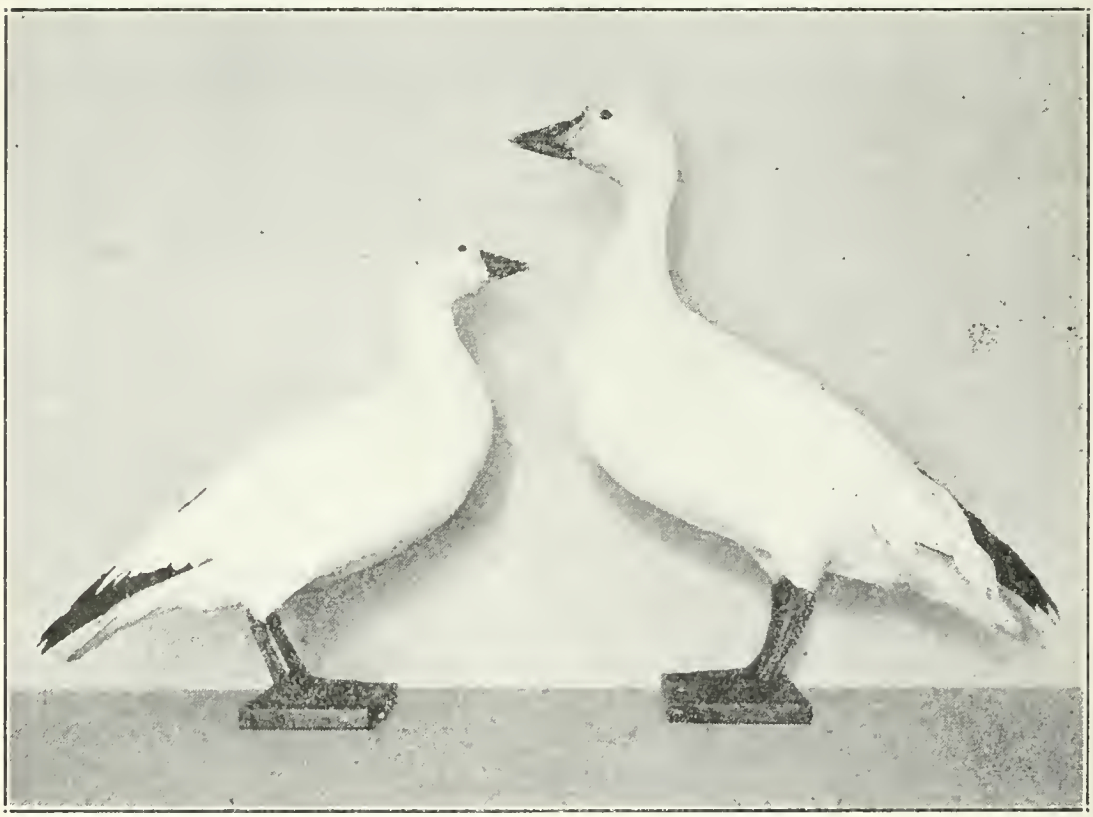


Fig. 118. Adult Ross (left) and lesser snow geese. Photograph of mounted specimens in Chase Littlejohn collection. Photo by author.

pounds, averaging about 3 pounds. Its body is little larger than that of a mallard duck, but it appears larger in flight on account of its longer wings, tail and neck. Male Ross geese, like other geese, average slightly larger than females. Fig. 118 shows a mounted specimen of an adult male Ross goose in contrast with a lesser snow goose of the same age and sex. The latter species which weighs from 4 to $5\frac{3}{4}$ pounds, is well known to most California hunters and the photograph shows the small size of the Ross goose in comparison. Both birds are pure white in plumage except for black primary flight feathers or wing tips. Sometimes the feathers of the head and neck, particularly those near the bill, and underparts are rusty or reddish. This is caused by a deposit of iron oxide derived from water containing this mineral that the birds feed in and occurs more often and to a greater extent in the lesser snow goose than in the smaller species. The bills and feet and

legs of both species are bright pink in color. The Ross goose differs from the lesser snow goose chiefly in size, but it also has proportionately longer legs and shorter neck and bill. Adult Ross geese, particularly old males, have warty protuberances known as caruncles at the base of the upper bill that are somewhat like small turkey wattles. These are characteristic of the species and never occur in the lesser snow goose.

The hunter will most frequently encounter the Ross goose in flight where it is rather difficult to distinguish from the lesser snow goose. When Ross geese first arrive in California in the fall (October), they are in large flocks all of this species. These aggregations soon break up and later in the season the smaller birds are often mixed in flocks with lesser snow geese. When a flock contains both species, the smaller birds may be distinguished by their size and comparatively short necks. Another distinction between the two species is voice. The loud call of the lesser snow goose is too well known to California hunters to warrant a description here. The call of the Ross goose is entirely different. This species has no loud or shrill call and utters only a simple grunt like *kug* or weak *kek kek* or *ke-gak, ke-gak*. Once heard this call is readily recognized again and is very distinctive of the species for no other California goose utters a similar note.

Nothing in habits or manner of flight will serve to distinguish these two species, unless it be the Ross goose's custom of darting in flock formation from a height to a lower level and their slightly more erratic flight. Ross geese do not decoy well and entire flocks of this species seldom "work" in close to either live or "dummy" decoys. When mixed in flocks with lesser snow geese, however, the smaller birds often accompany the larger ones into decoy stands.

The young Ross goose is quite similar to the adult except that its back and top and sides of head are ashy gray and its secondary or inner flight feathers are dark centrally. The young of this species are never as dark as juvenile lesser snow geese.

Cackling Goose (*Branta canadensis minima*). This bird is better known to most California hunters as the "little brant" or "yelper." It is a very abundant winter visitant to the Sacramento and San Joaquin valleys and is also numerous at Tule Lake and other points in northeastern California until driven out by severe weather in midwinter. It is not common at any season in southern California and most of these birds do not apparently go farther south than the San Joaquin Valley. In point of numbers this is probably the most abundant goose wintering in California and local sportsmen do not understand why it was given absolute protection by the recent Federal amendment. The reason is that this bird, like the Ross goose, winters almost exclusively in California, where its numbers, even though still large, have been greatly reduced, and a closed season for a period at least was considered necessary to preserve the species.

Cackling geese nest in a rather restricted region along the Behring Sea coast of Alaska from the Aleutian Islands north at least to the Seward peninsula. In migration they pass through Oregon and Washington where some were killed each fall, but nearly all seem ultimately to winter in our central valleys. The bird does not occur east of western Nevada or eastern Oregon and Washington except as a stray. Little brant reach California in mid-October and are numerous from early November until April. More cackling geese were killed each hunting

season by commercial goose hunting stands in the Sacramento valley than all other species combined throughout the whole State. This kind of goose shooting over large bands of live decoys with batteries of hunters in a line of pits has been modified so by recent State and Federal laws that killing large numbers of geese over decoys will probably never occur again in California. It is now illegal to use more than 10 live goose decoys to a stand and special State and Federal permits must be obtained to possess the decoys. Commercial clubs are prohibited from shooting more than two hunters from a blind and blinds must be at least 80 yards apart under recent State law. These regulations, plus the reduced Federal limit of four geese per day and eight per week, should afford sufficient protection to cackling geese to preserve the species should the season be opened on them in the future.



Fig. 119. Adult male Hutchins goose. Photograph of mounted specimen in Chase Littlejohn collection. Photo by author.

Hunters and even ornithologists have considerable difficulty in distinguishing the cackling goose, or little brant, from the Hutchins goose which they more frequently term the big brant. These two birds have generally been considered subspecies of the Canada goose, or honker (*Branta candensis canadensis*). All three are quite similarly marked and size and voice are the main respects in which they differ. Most hunters are thoroughly familiar with the honker, our largest goose, which seldom weighs less than eight pounds. Canada geese average about 10 pounds in weight and large individuals have been recorded as weighing at least up to 17 pounds. They are readily distinguished by their size and are seldom or never confused with the smaller Hutchins goose.

Fig. 119 depicts an adult Hutchins goose of average size and markings. Considerable variation exists within this subspecies and

some individuals are darker ventrally than the specimen figured. This form is ordinarily 25 to 29 inches in length but occasional individuals even exceed these measurements. Their weight varies from four to six pounds.

The cackling goose is a smaller bird than the Hutchins goose and is almost a counterpart of the Ross goose in size and weight. Cackling geese weigh from $2\frac{1}{2}$ to $3\frac{3}{4}$ pounds and measure from 22 to 25 inches in length. They are generally marked like Canada and Hutchins geese, but average much darker in color ventrally. Adult cackling geese are deep grayish-cinnamon brown below, but young birds are lighter in color and some are as light as Hutchins geese on the under surface. The backs of old cackling geese are bluish-gray brown in color, rather than dark brown barred with lighter brown as in the Hutchins goose. Again this distinction is not shared by juvenile birds and young cackling geese have almost as dark upper plumage as their larger relatives. The bill of the little brant is very short and averages but an inch and a quarter in length, while that of the Hutchins goose is usually over an inch and a half in length. Most of these differences, except size, are impossible to distinguish in life, particularly in flight. Fig. 120 shows typical adult males of the two subspecies, and illustrates their comparative sizes. Note that the lighter under surface of the Hutchins goose commences abruptly behind the black neck, while the darker underparts of the cackling goose blend gradually into the black neck, behind the white collar. This white band around the base of the black neck is a variable feature in both subspecies, and may or may not occur. The continuity of the white cheek patches around the throat or their separation by a

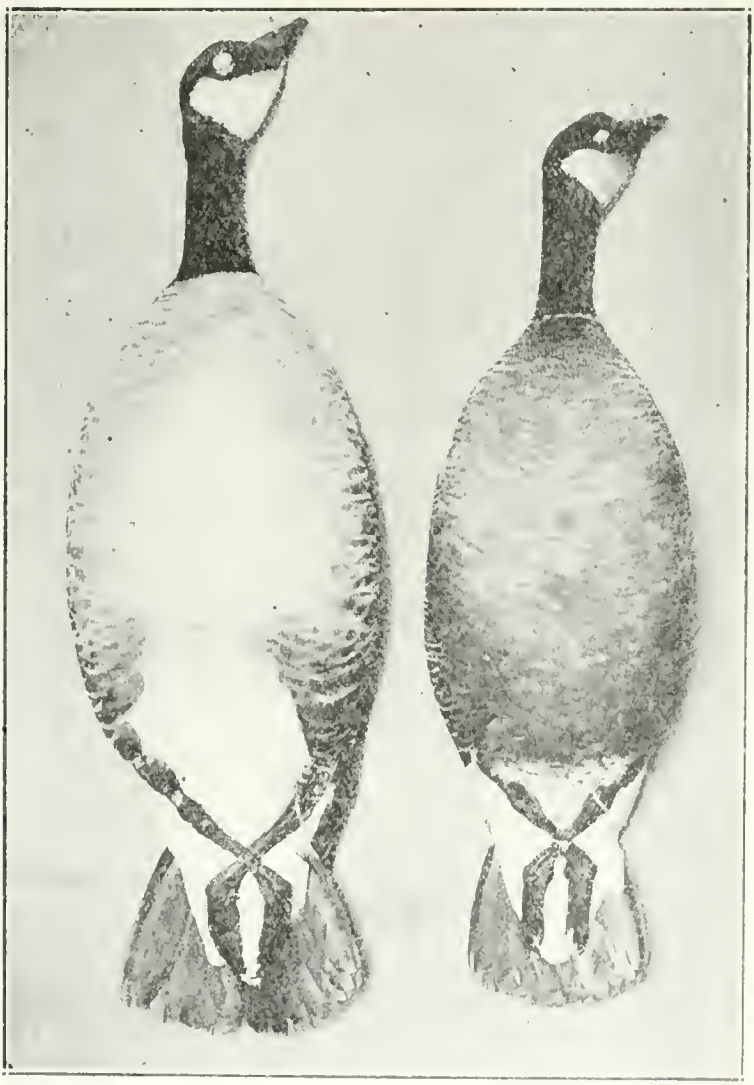


Fig. 120. Adult male Hutchins (left) and cackling geese. Photo of scientific skins in the author's collection. Photo by author.

black throat band of variable width is another feature common to individuals of both subspecies and therefore worthless for identification purposes.

Distinctions that will serve to identify the subspecies in flight are what sportsmen are most concerned in and while such differences exist, they are difficult to convey in words. Once a hunter of average perception has these characters pointed out to him in the field he will have little difficulty in separating the birds in future, but I am not confident that they can be conveyed in writing.

The birds differ in manner of flight and in appearance. The Hutchins goose gives the impression of being a rather long-necked bird and it progresses with relatively slow and short wing beats. Its wings do not appear to be particularly long in comparison with the bird's size, nor noticably pointed. Its flight may be termed rather "heavy" compared with that of the little brant. The cackling goose has comparatively longer, more pointed wings which are flapped more rapidly and through a longer stroke than those of the big brant. Its flight seems lighter and less laborious than the larger birds and it is a more active bird in the air. The little brant's neck appears shorter in relation to its body than the larger ones, but this does not give the cackling goose a "chunky" appearance as might be expected, as it is offset by the bird's relatively greater wing length.

Voice or call notes serve best to distinguish these two geese in the field. The call of the cackling goose is much higher pitched and shriller than that of the big brant. The smaller bird also utters some notes that are not even similated by the larger one. Bird voices are at best poorly imitated by written word and it is particularly difficult to attempt to convey an impression of goose calls here. However, the following syllables may aid some readers in recognizing the cries of these birds. The cackling goose in flight most often utters a yelping *yelk, yelk, a-lick, a-lick* or *lick, lick, lick.* Hutchins geese have lower toned, deeper voices and render notes that might be written *lo-ank, lo-ank, a-lank, a-lank* or even *lo-unk, lo-unk.*

The best way of surely learning how to distinguish these two geese in the field is to have someone familiar with the differences point them out in life. Once seen or heard, they will readily serve to identify most individuals that may be encountered, and, in fact, the voice and flight characters are quite as pronounced differences between cackling and Hutchins geese, as are other characters to be noted with the birds in hand.

THE PROPAGATION OF CALIFORNIA QUAIL IN OPEN BREEDING GROUNDS

By Walter R. Welch

The following editorial was published in the Oakland, California, *Tribune*, August 20, 1931:

"INVITING HIM BACK

"California has named the Quail the State bird. New York is bemoaning the fact that Bob White Quail, once so numerous, is almost extinct, and is taking means to remedy the situation.

"The State Conservation Department there has ordered from a breeder in Virginia 3400 quail to be distributed for propagation in various parts of New York. It is explained that the greatest enemy to the quail in the Empire State is not the hard winter, but the rapacity of the pot hunter.

"Virginia, the state which is furnishing New York with quail, had a similar experience. Its Game Commission lent its support to systematic attempts to arrest the decline of the birds, and one man, William B. Coleman, conducted a successful attempt in breeding the birds in captivity. Within ten years he released approximately 20,000 birds.

"So anxious is New York to get the quail back, farmers and sportsmen have promised to cooperate with the Conservation Department. Grain is to be left in the fields for the birds to feed upon, and supplementary food supplies are to be provided when winters are severe. New York did not realize how much it valued Bob White until he had departed."

When we take into consideration the fact that California has an area of 157,297 square miles, and a coast line more than 1000 miles in length, and that this area in square miles is equal to the area of all of the New England states, with New York, New Jersey and Pennsylvania added, we can realize that if it required ten years to propagate 20,000 quail in captivity to be used for restocking the game fields of Virginia with quail, how long it would take to propagate in captivity a sufficient number of quail to restock the game fields of California.

Among the most important of all of the game birds native to the State of California, and the birds to which the sportsmen of this State are most deeply indebted for their sport afield with dog and gun, are, in my humble opinion, the Valley and Mountain Quail. These birds, which test not only the skill of the hunter, but the good qualities of his dog, are to be found on the farms and in the fields, in the valleys and on the hills, in the desert, in the wilderness of the forests, and on the mountain sides and peaks throughout the entire State.

They are the friend and helper of the farmer, orchardist and vineyardist, the companion of mankind, and well merit being called the "Plumed Knight of the Chaparral," and selected by the Legislature as the bird to represent the State of California.

While at one time Valley and Mountain Quail were to be found in countless thousands throughout the entire State, during the past decade their ranks have been so greatly reduced that at the present time there remains only a remnant of the once bountiful supply of these beautiful, as well as game birds.

How to maintain, if not increase the present supply of these native game birds is a problem that the Fish and Game Commission, as well as the sportsmen and the people of California are endeavoring to solve.

As the matter of reestablishing the supply of native game birds is one that has been and is being given considerable attention in many of the states at this time, and as many theories have been and are being advanced along those lines, it might be well to briefly mention some of them prior to outlining the system that is being undertaken in this State in an effort to reestablish the supply of quail, and to solve the quail problem in California.

Some of the eastern states in an effort to reestablish the supply of native Bob White Quail have adopted a system of propagating quail by the use of electric incubators on State game farms. This system has

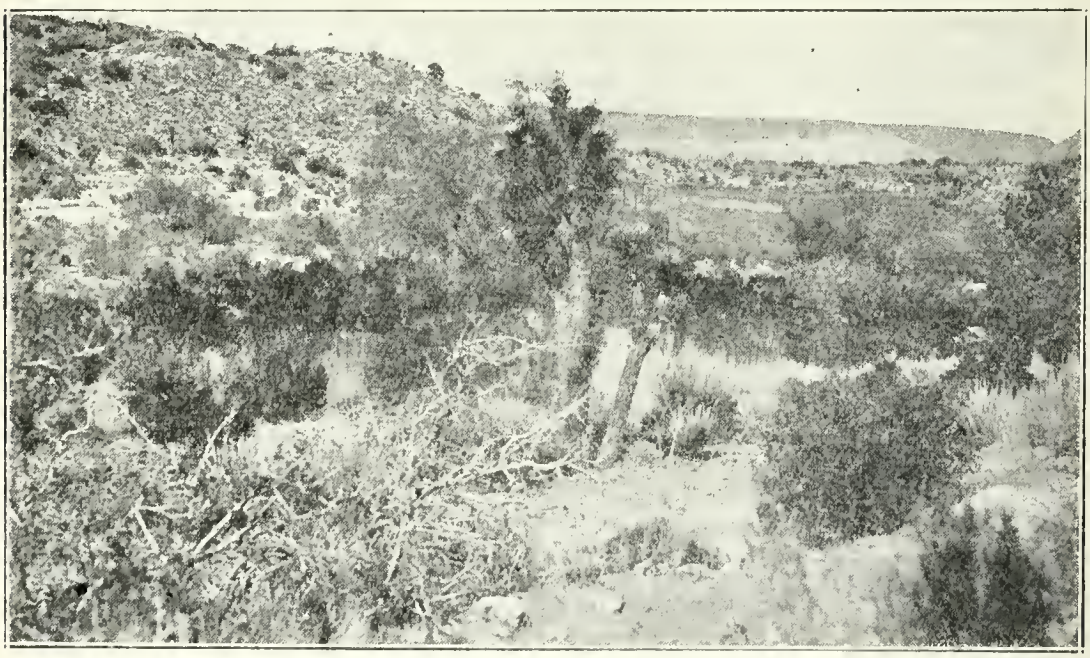


Fig. 121. Quail generally seek water twice a day—morning and evening. Hunters often destroy the birds by pot hunting at the water holes. Here is a fine watering place at Whitewater where the birds are now protected through the sanctuary system. Photo through courtesy of W. A. Roth, August, 1931.

proven to be fairly successful, but it involves a great deal of work, care and considerable expense, with the result that it costs the State from $2 to $7 for each quail thus propagated.

Another system that has been adopted by some of the states, also with some measure of success, is that of propagating quail through natural channels in open breeding grounds.

Under this system the state leases large tracts of land that are adapted to quail, where the quail raise themselves under natural conditions, the surplus birds being trapped and distributed a few pair here and a few pair there, to restock the shot-out lands of the farmers. Under this system it has been found that the quail can be raised by the state at a cost of about 50 cents each.

Among other systems that have been adopted by some of the states in an effort to maintain, if not increase the supply of native game birds and animals, and one that has met with some degree of success, is that of encouraging farmers and landowners to consider a

supply of game an asset, and a means of deriving a revenue from their property by charging sportsmen a fee for the privilege of hunting and shooting on their lands, or renting their lands to hunters the maximum fee per day or per acre that can be collected by the landowner being fixed by State law.

This system appears to be working out satisfactorily and beneficially to the interest of all parties concerned in the state of Texas at the present time.

To protect quail in California, the present State law provides for an open season between November 15th and December 15th in all districts except in district 1½, in which district the open season is between November 1st and December 31st; provides for a daily bag limit of 15 and a weekly bag limit of 30 valley quail, and a daily bag limit of 10, and a weekly bag limit of 20 mountain quail, and prohibits the trapping or sale of any quail at any time.

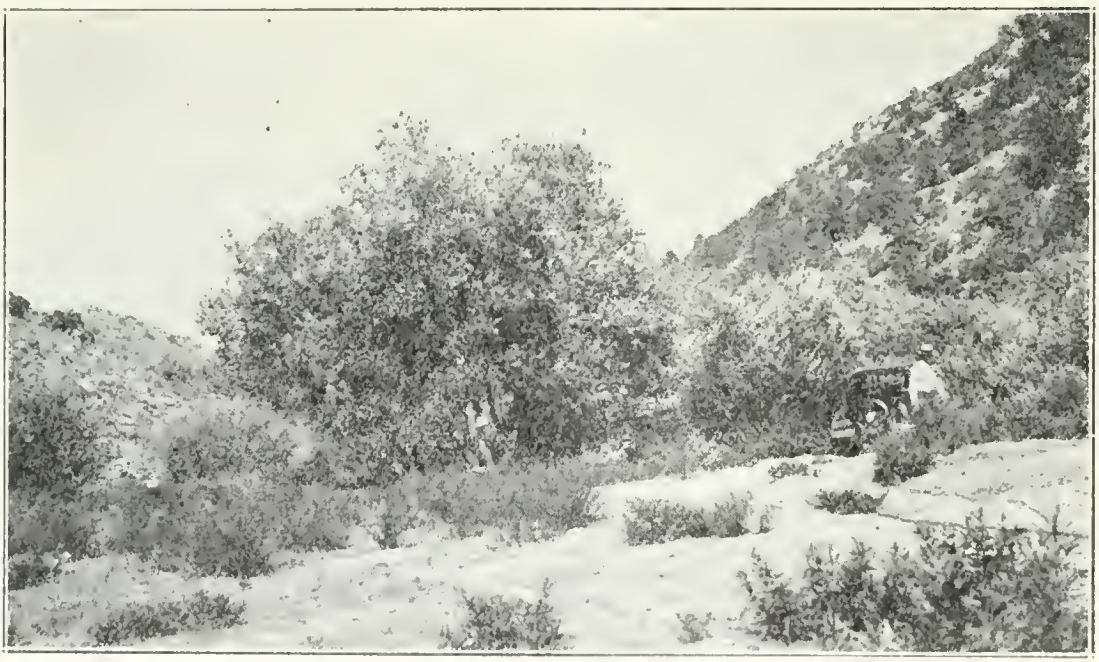


Fig. 122. Hunters camp at this location but are prevented from shooting on the sanctuary ground by a system of "warning" signs. This is excellent country for the propagation of quail. Photo through courtesy of W. A. Roth, August, 1931.

Coupled with the protection afforded quail under the State law, and in an effort to maintain, if not increase the supply of quail and to solve the quail problem, the Fish and Game Commission of California is propagating quail by the use of electric incubators installed at the State Game Farms located at Yountville and Chino, and have also established two suitable State quail refuges in the southern part of the State, where quail will be propagated through natural channels on open breeding grounds.

On one of these State quail refuges the birds will be supplied with ample water, feed and cover, and every attempt made to keep the birds free from disease, and to afford them protection against attack by hunters, and all birds and mammals considered to be the enemies of quail.

On the other State quail refuge, aside from seeing that the birds are able to secure water and feed, and that they are not molested or disturbed by hunters, no attempt will be made in the way of predatory bird and mammal control on the refuge, and the birds left to propagate themselves on the refuge under natural conditions.

Under this system the Commission hopes to be able to determine many important matters, and to secure much important information relative to what method it will be advisable to adopt in propagating quail with which to restock the depleted areas, and in solving the quail problem.

In conjunction with the work being done by the Division of Fish and Game to propagate quail with which to restock the depleted areas, and in an effort to maintain, if not increase the supply of quail within the State through natural channels in open breeding grouds, from the nucleus of wild quail now in the field, the Fish and Game Commission

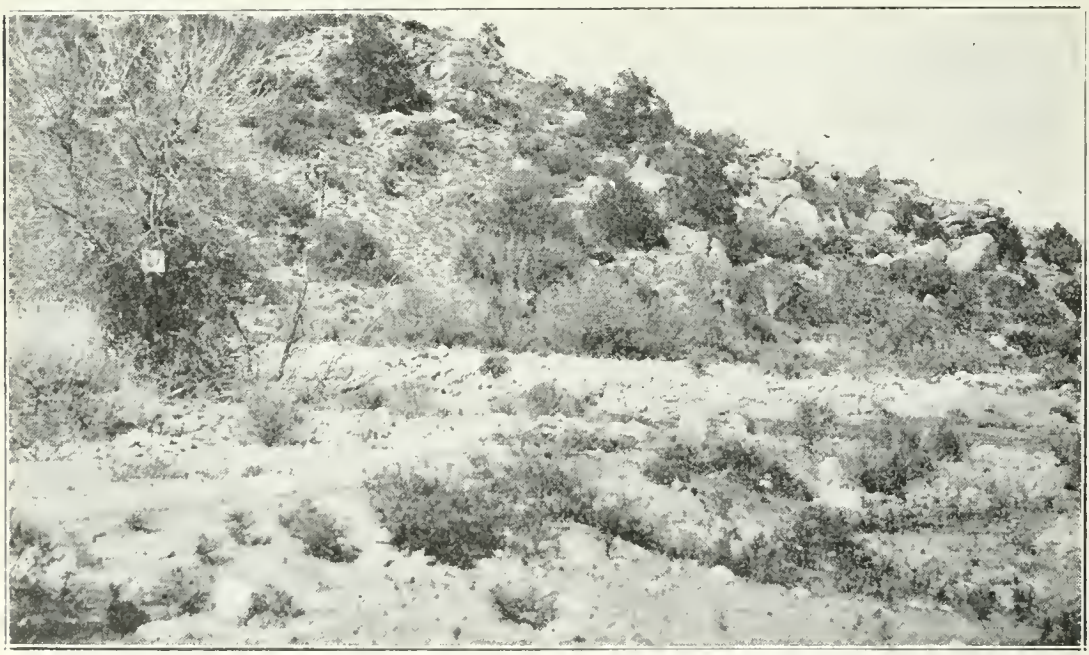


Fig. 123. One of the boundary lines of a quail sanctuary established at Whitewater. Note the "warning" sign on the small tree at the left in the picture. Photo through courtesy of W. A. Roth, August, 1931.

is conducting a campaign for the voluntary establishment of inviolate quail sanctuaries and game refuges by farmers and ranchers on their lands.

This campaign, which is being conducted by the Commission solely through the medium of the volunteer deputies of the Division, and the members of the various fish and game protective associations and clubs sponsoring their appointment, has met with the spontaneous cooperation and support of farmers, ranchers and landowners throughout the State, with the result that during the past year upwards of 1000 inviolate quail sanctuaries and game refuges have been established within the State.

These quail sanctuaries and game refuges are located in nearly every county in the State from Modoc to San Diego, and contain about 600,000 acres of land, upon which it is estimated there are at this time about 300,000 wild Valley and Mountain quail.

In establishing quail sanctuaries and game refuges on their lands in cooperation with the movement being conducted by the volunteer deputies of the Division of Fish and Game for the reestablishment of the supply of quail, the landowner enters into a so-called "Gentlemen's Agreement" to the effect that he will set aside certain parts of his land as an inviolate quail sanctuary and game refuge, and that he will not hunt or shoot, or allow any hunting or shooting to be done on the area thus closed, for a period of three years.

With this understanding, the volunteer deputies through the association or club sponsoring their appointment, supply the landowner with proper notices for posting the closed area, and assist him in developing water and feed for the quail on the sanctuary, and in protecting them against attack by predatory birds and animals, pothunters and poachers.

In conducting their work of predatory bird and mammal control on quail sanctuaries and game refuges, the volunteer deputies of the Division of Fish and Game, between January 1 and July 1, 1931, have destroyed the following number of birds and mammals that are considered to be enemies of quail: 38 coyotes, 33 bob cats, 684 house cats, 35 foxes, 43 coons, 8 weasels, 2 opossums, 1 badger, 5 wild and unclaimed dogs found destroying deer and the nests of quail, 365 sharp-shinned and cooper hawks, 3972 blue jays, 293 magpies, 81 crows, 49 butcher birds, 2 great horned owls, and 47 snakes.

The reports received from the game fields during recent months indicate that in spite of this having been a dry year, late and cold rains, and cloud bursts in some sections of the State, the quail have bred well, the broods of young birds have been large, and that there is a decided and noticeable increase in the supply of quail on the quail sanctuaries in every part of the State, all of which conclusively supports the contention that there is no game bird that will more kindly or quickly respond to protection than our native Valley and Mountain Quail.

In areas where they are afforded proper protection, water, feed and cover, and are not molested or disturbed, they become very tame and can be seen along the road side or wherever proper cover is near, and will build their nests in old straw sheds and hay barns, and also in gardens, near dwellings, where they become almost as gentle as the domestic fowl.

PLACE NAMES OF FAMOUS SHOOTING PONDS

By W. W. Richards

THE LARGEST closed body of water in Marin County is what is known as the Roos Pond on the Allegra Preserve near Teal Station. Way back in the early seventies, this famous pond was known as the Sixth-Reach Pond, it being just opposite the sixth reach of the Suisun Slough from its mouth where it flows into Suisun Bay.

On the Teal Club, we have the old Smith Pond, which was famous for its canvasback. This pond was named after G. Frank Smith, one of California's leading attorneys of that day.

The Titcomb Pond, also on the Teal preserve, was named after the broker here in San Francisco.

The Taylor Pond, under the Teal preserve, was named after one of the club members, Senator W. W. Taylor.

What is now known as the Tule Belle Club, owned by Charlie Joslyn, Fred Van Sicklen, Herman Oelrichs and others, was disbanded and the interests of the others were sold to Herman Oelrichs. Prior to that time, during the early seventies, these were known as the Thickbroom ponds, after the owner of that area, including several hundred acres.

The big pond to the north and east of Cygnus Station, now owned by George Gross and Hall Richardson of Oakland, was formerly presided over and shot on during the early seventies by Captain Floyd, at one time a commander in the Confederate Navy during the Civil War.

This writer first shot on the Suisun Marsh in 1869, when there were no preserves and the ponds had no especial names, and were referred to only as "where Jim Payne shoots" or "where Seth Beckwith shoots," etc.

But in those days it was not a matter of how many ducks we could kill, so much as it was how many ducks we could get out to market.

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"There is an inspiration in the out-of-doors which is the best possible remedy for sorrow and depression, both physical and mental."—William Colby, *Sierra Club Bulletin.*

GLENN-COLUSA DECISION

California's fish screen program for the protection of food and game fishes in our streams has been materially aided by a decision in the Superior Court at Willows, Glenn County, on June 22, 1931.

The decision, made by Judge H. S. Gans, presiding in Willows, holds that the State has the right to enforce the installation and maintenance of suitable screens to prevent the fish from entering the diversion pumps of the Glenn-Colusa Irrigation District. This case has been of keen interest to those interested in the conservation of fish life and irrigation projects.

A history of the case shows that the Glenn-Colusa Irrigation District supplies water for the irrigation of 120,000 acres, more or less, in Glenn and Colusa counties. To obtain the necessary amount of water it is essential to employ large diversion pumps working in the Sacramento River. Records show that the suctions of these pumps were unguarded.

The Division's attorneys maintained that large quantities of food and game fishes went through the pumps and thereby perished. As smaller water diverters in various sections of the State are required to use screens to protect fish life, the Division insisted that the large projects should be required to do likewise.

In presenting their case, the Glenn-Colusa Irrigation District maintained that the fish that went through the pumps were mostly rough species of no value, that the percentage of loss going through the pumps was small, that screens would greatly interfere with the operation of the pumps, and various other reasons.

Presenting arguments in its case, the Division produced about 6000 fish or pieces of food fishes that were taken below the pumps at the headworks of the canal and preserved as evidence. The State also argued that the greater proportion of fish that went through the pumps were killed or injured critically, that other operators have utilized fish screens for years without retarding the efficiency of the pumps, and that the cost of installing such screens would not be excessive.

Judge Gans ruled, in part: "I conclude that the evidence shows that a nuisance exists as is alleged and that it should be abated; notwithstanding the fact that the diversion is under authority of Congress and the diverter is an irrigation district under duty to serve land owners within its limits. * * * The diversion and operation of the district are required to be carried on in a lawful manner and one not damaging others or interferring with the use and enjoyment of property."

IN MEMORIAM G. H. LAMBSON

G. H. Lambson was born at New Castle, Delaware, May 11, 1863, and passed away June 1, 1931. He was one of the leading fish-culturists of the United States.

He entered the service of the Bureau of Fisheries in the car-messenger service in 1886. After a successful career in fish distribution, he was appointed superintendent of the salmon hatcheries at Baird, Battle Creek and Mill Creek, California, after the California Fish and Game Commission had transferred the Battle Creek and Mill Creek salmon stations to the then United States Fish Commission, later known as the Bureau of Fisheries.

On March 1, 1916, he was appointed superintendent of the Sisson Hatchery, later named the Mount Shasta Hatchery, succeeding W. H. Shebley, who had been appointed in 1910, superintendent of the California hatcheries and whose duties then called him from the active work at Mount Shasta Hatchery.

Mr. Lambson introduced the Chinook salmon into New Zealand in 1900. He succeeded after several attempts had been made by fish-culturists from New Zealand and several shipments of Chinook salmon eggs had been sent to that country by the New Zealand Government from the Pacific coast salmon stations.

Mr Lambson had a host of friends. He was a loyal, efficient employee and a courteous and kindly man, who held the esteem of his superiors as well as the crew that was in his employ. The Division of Fish and Game has lost, in the death of G. H. Lambson, one of its most efficient and loyal employees, and the State a good citizen and a good man.

During his fifteen years of employment by the California Fish and Game Commission, he was constantly on duty. He did not take a vacation during the entire period of his employment. The long arduous strain of his many years of devotion to his duty, had a great deal to do with his untimely death. Mr. Lambson's mother passed away, at the age of 93, three weeks before him. He had just returned from Delaware after placing his mother's remains beside those of his father, when he was suddenly stricken in his office and passed away.—W. H. S.

GAME AND FISH ON CROP BASIS IS AIM IN NATIONAL FORESTS

A continuous yield of fish and game with replenishment each season like the repetition of crops of the field, is the ideal of the the Forest Service, U. S. Department of Agriculture, for the woods and streams in the National Forests, according to the Chief Forester R. Y. Stuart.

Declaring that the total production of fish and wild life of the country is inadequate to meet the ever-increasing demand for outdoor recreation, Major Stuart sets forth the aims of the Forest Service in restoring and developing recreational and fishing opportunities.

"All National Forest land must be devoted to its most productive use for the permanent good of the whole people," he says. "That means a continuous yield of each crop the land or water is capable of producing. The Forest Service is applying this principle by harvesting the timber and forage crops on a sustained yield basis. The same principle must apply to wild life."

The National Forest program is fitting itself into public plans and the Forest Service is ready to cooperate in any sound national game program, Major Stuart says.

"The continuous yield of fish and game as a practical working principle is gaining ground," he states. "That certain species are almost extinct on some areas, that there is a satisfactory breeding stock with inadequate increase on other areas, while still other areas are overpopulated, clearly indicates the need of applying the principle on National Forests. All land and water are capable of producing some species of fish or game or fowl or fur-bearing animals or a combination of them, beneficial to mankind."

In reference to game refuges and stocked streams, he says, it is immaterial whether State or Federal agencies take the responsibilities for their regulation and productivity, so long as such areas are administered effectively. A total of 267 State game refuges, including more than 20 million acres have been established on National Forest land. These areas are administered jointly by the States and the Forest Service. In a few cases refuges have already developed an overpopulation of wild game. But generally a maximum of fish in the streams and lakes has not yet been attained. Only by hatching and releasing many millions of fish of the proper size, can the management agencies give every man his chance for a good catch.

To give the game and fish a fair opportunity it is necessary to protect the refuges from unlawful hunters and fishers, predatory animals, parasites, and also from forest fires. Fires are as fatal to fish as to animals. Loss follows from unregulated streamflow, mud, poisoning by ashes, and destruction of natural food through a combination of these conditions. The growth of public sentiment against fire has been of great help, and last year, for the first time in history, forest fires in the National Forests of the United States were kept down to a safe minimum. Continued care on the part of the millions of visitors to the National Forests will aid in attaining the hopes of the nature lover, the hunter and the fisherman.

At this time stream surveys are being made in the National Forests to determine the fish-carrying capacity of the streams, the adaptability of streams to various species, and to prevent duplication of effort. The Bureau of Fisheries and the State game and fish commissions are cooperating in gathering this information.

FOREST FIRE HAZARD

California is faced with one of the most serious fire hazard situations in many years. Fires will be quick to start and hard to control.

Hunters, anglers and motorists are presented with a rare opportunity for displaying good citizenship, but many will not respond.

There are going to be some very serious fires before the season is ended. Fish and game will suffer along with other resources. Taking past seasons as a criterion this seems inevitable and there isn't much use of trying to dodge or hide the issue.

Those who are in the field stand in a fine position to keep the loss as low as possible. The United States Forest Service gladly gives the Division full cooperation in advancing our conservation work and we can be of good service to them by furnishing them with information within our reach.

It is also possible for the Division field men to be of great assistance by helping to educate the public on out-of-door conduct. Whenever and wherever possible it would be good practice to remind hunters, anglers and motorists of the fire hazards.

Forests can be kept green and fish and game resources of the State conserved if everyone will observe a few simple rules. It is unlawful to throw lighted matches or burning tobacco from an automobile.

Leaving an unextinguished campfire is a careless folly of which no good citizen should be guilty. Those who venture into regions where fire peril exists have a greater motive for care than simply fear of the law.

It is hard to believe, sometimes, that anyone would be so foolish or thoughtless as to forget the simple rules of safety. Talk to any forest man for a short time and he will tell you some surprising things.

About the only way to teach some persons to think on a subject is to remind them constantly. Repetition is one of the secrets of radio advertising success and the habit is quite applicable in this case.

LIMIT

Only frequently, hunters and fishermen are imbued with the belief that to get the "limit" is the height of something or other, as if great laurels accompanied such accomplishments. Their idea of a "good time" is to get the limit, whether it be duck, trout, or what have you. They, apparently, never once stop to realize that game limits are not fixed on estimates of how much game one individual can properly make use of, but, instead, are really the "dead lines" beyond which game faces extinction.

In the backwoods country we still have people who do not consider themselves as amenable to and are consistent violators of our game laws. However, this much can be said for them. They take only what they can use—no more.

Persistent law violators, as they are, the question arises whether they actually kill as much game illegally, the year around, as is killed by some self-styled and limit-seeking sportsman who as persistently lets such game go to waste.

Forget the "limit"—and take only what you can reasonably hope to use. Take what birds you can use only, and practice on clay birds. Take what venison you can use, and sweeten up your marksmanship on predators or on the range. Take what fish you can use, and practice your casting on contest pools.

No greater hog exists than the game hog—he who kills for the lust of killing. Such are no better than poachers or violators of closed-season laws—they're not as good—for they waste, deliberately waste, wild game life, the conservation of which is now commanding the attention of our federal government, with millions of dollars being spent to save the game which such game hogs are deliberately wasting.

Forget the "limit"! Take no more than you can reasonably use. Spread that cry!

Another ominous fact looms up. Hunting license sales in California for 1930 shows a shrinkage of $42,000 compared with 1929 receipts. No game, no licenses, eh! Fishing licenses increased $40,000 for the same period.—J. H. Neustadt, *San Mateo Times*, May 2, 1931.

HOLD DOGS IN CHECK

During the past year or so a great deal of light has been cast on the depredations of the house cat in relation to our bird life. The criticism heaped on this species of domestic pet has, no doubt, been quite justifiable in most cases but in seeking solutions to the problem we should not become blinded to the acts of other members of household animal friends.

How about the dog? Is this member of the tribe of pets as spotless in the animal world as some would lead us to believe?

There is little or no doubt but what the dog creates an immense amount of damage to the wild life in a year's time. This animal may not actually do the killing in many cases but the damage is done during the chase—the pursued often receives injuries through accident that brings untold suffering and lingering death. Deer populations suffer greatly from this source.

True, efforts are made to keep these fleet canines within bounds in our forest sections through the medium of the leash or confinement. It is also true that a great deal of damage is done through ignorance on the part of owners.

Vacation time is here and hundreds of families will flock into our wooded sections for healthful recreation. Of course "Fido" is a member of the family circle and he will ride along atop the pile of canvas or on a special runningboard cage. When camp is reached he will have full sway of things and woe to any of the wild animals that come within the reach of his sensitive scent.

Perhaps a sensible campaign of education would not be amiss at this time. A few kind words of enlightenment to enthusiastic vacationists should tend to create interest in our wild living things and alleviate much suffering.

Of course, the stray dog and the lawless person who uses the dog to run game from refuges to shootable territory creates problems in a different category.

The dog as a regulated pet is a priceless asset—let's keep him so.

CONSERVATION OF WILD LIFE IN AUSTRALIA

Australia, which has had a development more or less analogous to that of the American West, is now passing through a phase also experienced in America—the realization that reckless slaughter is threatening extermination of many of its unique animal species. This is resulting in activities looking toward their protection and preservation.

The koala or "native bear," an animal looking more or less like a bear but really a marsupial related to the kangaroo and the opossum, is an object of special solicitude. In New South Wales and other regions where it had been exterminated, efforts are being made to reintroduce it.

The so-called marsupial wolf or thylacine, not so harmless and good-natured as the koala, has been mercilessly hunted and now survives only in northwest Tasmania. The Government of Tasmania has lately taken steps to protect the survivors of the species, and now forbids the exportation of thylacine pelts.

The Australian opossum is another animal that is being overhunted. In the state of Victoria alone, which has a three-months open season, at least one million are killed annually, and conservationists are becoming concerned lest the fur trade destroy itself through its own over-eagerness for profits. New South Wales is the only state where opossum is given official protection.

Although there are laws on the books to protect the native animal and plant life of Australia and Tasmania, there are not enough rangers in service to secure proper enforcement. However, voluntary assistance of interested persons is now being enlisted; and there is a movement on foot to establish nature sanctuaries and parks.—*Science*, Vol. 73, No. 1897, May 8, 1931, page 14.

REPORT AFTER GAME INVESTIGATION

"Game conservation has not yet come to grips with the fundamental causes of wild life depletion," Aldo Leopold said in a report just published on his two-year survey of game conditions in eight north central states. Presented as the first complete investigation of the kind ever undertaken, the survey covered Michigan, Wisconsin, Minnesota, Iowa, Illinois, Missouri, Indiana and Ohio.

The survey was made to discover the extent of game scarcity, the causes and possible remedies. Leopold declared, that "More game would be produced by paying the farmer a bonus on hedges and brush covers than by spending thousands of dollars a year as at present on foreign birds. The machinery is already here for the effective restoration of native game."

He said that the most important factor in the destruction of wild life is the debrushing of woodlots and drainage channels by agriculture and grazing. "The policy of modern farming is to turn every yard of land into crops or pasture. All other conservation measures are but stop-gaps until this fundamental deterioration of environment is in some way checked. The net trend of game is downward on the best soils, and will so continue unless counter forces are brought to bear upon the landowner."

As the chief remedy the investigator urged that farmers be compensated for making their land produce desirable wild life. He also urged that public ownership and management of game lands be extended while such areas are still available at low prices, and that funds for restoring nongame species be collected from general taxation, instead of from sportsmen's license fees.—*The American Field*, March 28, 1931, p. 375.

AVIATION HELPS CONSERVATION WORK

Aviation is finding its place in fish and game survey work as well as being of service in fighting forest fires and the preservation of other natural resources.

In the establishment of migratory bird refuges there is excellent use for the airplane in making surveys of the lands under consideration. Its value for such work is unlimited.

Without the use of planes it was necessary for officials of the Division to prowl around the swampy areas to ascertain the real value of the lands for the purpose. Under such a system it was almost



Fig. 124. Airplanes are of great service in conservation survey work. Here is a fine picture taken of some marshy area in northern California by the Governor's Advisory Committee on Game Refuges and Public Shooting Grounds.

impossible to secure necessary information without attracting local attention and defeat the purpose.

Now the conservation workers are enabled to make a quick detailed account of the proposed refuges and to take photographs if necessary. Drainage areas can be thoroughly studied and available water sources sighted.

Aside from the preliminary work the airplane is also an important factor in following the flights of birds.

Such a migratory waterfowl survey is now being planned by J. S. Hunter, director of the Bureau of Refuges, and will be completed later in the season over the State refuges in the Sacramento and San Joaquin valleys. Much important data will be gathered in this way.

SPORTSMANSHIP

Hunting and fishing rank as the greatest of out-door sports. The taking of game and fish has ceased to be a mere food-getting activity. In most sports, poor sportsmanship is punished in many ways. The boxer who hits below the belt loses the decision; the ball player who fraudulently throws a game is barred from organized baseball; the golfer who does not comply with the rules is disqualified. But in the greatest of out-door sports, hunting and fishing, unsportsmanlike acts do not meet with such unanimous disapproval. Many who never think of cheating at a game of cards, or in a game of golf, do not hesitate to take unfair advantage of their fellow hunter or fisherman in taking game out of season, or in an unlawful manner or quantity, and even boast of their unsportsmanlike deeds. Poor sportsmanship is poor sportsmanship whether displayed in golf, baseball, football or in hunting or fishing.—*Montana Wild Life*, March, 1931.

FOREST FIRES AND GAME CONSERVATION

For many years a close working arrangement has existed between the wardens of the Fish and Game Commission and the State and Federal Forest Services. Our wardens have standing instructions to assist these services in every way possible in the prevention and suppression of forest fires. There are many instances where our employees have rendered most valuable assistance to these other conservation agencies. Many of the automobiles operated by our wardens are equipped with emergency fire fighting apparatus, to make more effective the cooperation which has so long existed.

Now and then we have brought to our attention the apparent improvement in game conditions resulting from fires, but a proper analysis of these situations usually reveals that game has been forcibly concentrated in nearby unburned areas; or else after new growth has appeared in a burned area, animals have crowded in, to take advantage of the tender sprouts. Either condition results in an increased kill during a hunting season, and the erroneous impression that game is more abundant. While the new food supplied by the new growth in burned areas may seem to partly compensate for the damage done, it must be remembered that these areas are stripped of the usual protective covering, so that birds and animals are exposed to the ravages of predatory animals if the hunter does not take his toll. And if the game escapes these hazards in the crowded areas, disease finds a new opportunity to spread among the injured and fatigued animals that may have escaped the fire.

I have been told by some—of the all too many who believe in burning, that fires control beetle infestations which do so much damage. That is a question which we must leave to our forest service friends, but I can well imagine that forest fires do exterminate beetles, for they certainly do that with quail and other game. It is probably as effective a pest control method as burning a dwelling would be to rid it of moths.

Our records contain many reports of the tragedies which are found in the wake of forest, brush and grass fires. The following letter from C. S. Robinson, Sequoia National Forest, is typical:

"During the recent Robinson fire in the Kings River Canyon, with several others I was watching the advance of the flames tearing up a small ravine. The wind was strong and directly behind the fire,

so that it came shooting up in great gusts and faster than a man could run.

"Some quail flew by and a few doves, one of whom settled on the branch of a tree ahead of the fire. The poor thing was evidently completely exhausted, as in a little while, after vainly endeavoring to rise, it fluttered to the ground and, for all I know, must have perished, as the smoke was so thick I could not see where it fell.

"Three deer passed close to us; then, just ahead of the flames came a young doe, very lame. She was badly singed and her feet must have been practically roasted. She seemed bewildered, showed no signs of fear when I went towards her, and lay down near a small patch of willows. By this time the fire was almost on top of us and we had to retreat. The last thing I saw as we ran was this little doe—she had struggled to her feet, and was standing with her head down between her legs, her back to the fire. The next day I found her body where I had last seen her."

The strong maternal instinct of many birds and animals causes them to sacrifice themselves in vain attempts to protect their offspring. In every forest fire we have enacted the most pitiful of tragedies. The contemptible doe killer is an amateur of destruction as compared with that master destroyer of game—the forest fire.

Even our fish do not escape. Cool waters become heated and loaded with ash, which gathers in the gills of the fish and suffocates many of those which may survive the high temperatures, and those escaping this fate are deprived of the normal protective vegetation.

Like contagious diseases, these fires may be checked and suppressed, and like diseases, they may be mostly prevented. For the good of our game, let us save their homes. Let us prevent the torture and suffering and destruction of the birds and animals. Let us keep our forests green, our skies clear, and our game secure.—John L. Farley, Executive Officer.

GAME FISHES

DROUGHT CREATES PROBLEM

Low water in the rivers created a serious problem for the fish culturist this year. In many localities along the coastal streams the water was so low that the fish were unable to reach the egg collecting stations and it was necessary to construct temporary locations farther down the river.

It was reported that many fish spawned near the mouths of the rivers and this was given as an indication of a very poor season. The fish, however, were in good condition.

Planting activities this season were exceedingly difficult because of the drought. Many tributaries had to be eliminated in order to get the best results from the trout raised.—J. H. Vogt, 510 Russ Building, San Francisco, California.

MORE LEISURE AND MORE TROUT

Depression, unemployment, shorter working weeks and the attending results are causing many persons to think seriously on various subjects. Here is what has been said in regard to angling activities:

Official recognition that unemployment and the five-day week have contributed a new problem on the fishing streams of the country is taken by the Federal Bureau of Fisheries.

More fishermen are whipping the trout streams and lakes than ever before in history and the principal reason for the shortage of fish is the added leisure. To this situation are added the factors of better roads to trout streams and the drought in certain states.

Lewis Radeliffe, deputy commissioner of the Federal department, has issued the following statement:

"For many years, interest in angling has been growing as the sport has increased in popularity and the ease of access to the country's fishing waters has been made possible by the building of roads and the increased use of automobiles. In some sections fisherman traffic to inland lakes has grown to such an extent as to necessitate the building of all-weather roads, despite the fact that travel on these routes is otherwise negligible.

"With shorter working hours, the five and one-half day week, and the trend toward the five-day week, the increased time available for fishing has been reflected in greater demands for the stocking of streams, especially by private game clubs and by owners of small lakes and ponds where the full day's catch was formerly a certainty.

"Besides the demand from these developments on the fish supply, the drought of 1930 also took its toll in the form of dried-up streams, lowered water levels and general stagnation. The Federal Bureau of Fisheries through its various stations throughout the country, the State commissions and private hatcheries are being enlisted to replenish the loss. The Federal bureau's contributions in the way of fingerlings, frys and small fish have been somewhat less than those of the States."

Immediate enlargement of operations of fish hatcheries is necessary to keep the streams supplied with enough trout to give the average fisherman a chance at half the legal limit.

RESCUE WORK STARTED IN 1928

Although fish rescue work has not been carried on for a very long period in California it has grown to be an exceedingly important bureau, according to records at the Division.

To go back into history the Bureau of Fish Rescue and Reclamation was organized and put into operation August 1, 1928. At that time Eugene D. Bennett, now attorney for the Division, was the executive officer.



Fig. 125. Fish rescue work has grown to be an exceedingly important branch of fish and game conservation in California. George Neale, in charge of the Bureau of Fish Rescue and Reclamation (left), and helper are seen planting rescued catfish in the San Joaquin River, near Tracy. Photo by E. S. Cheney, August, 1929.

In making a study of the conservation needs in this State, Bennett called a conference with George Neale, former executive officer, according to records.

After a lengthy discussion Bennett decided to create the Bureau of Fish Rescue and Reclamation, and he appointed Neale in charge of the work. Excellent results were obtained immediately.

Neale secured the services of Abe Woodard as net foreman. Equipment consisting of various types of nets, and fish cans were obtained and a program for the enlistment of volunteer help was launched.

During the first year more than two million fish, including black bass, crappie, catfish, bluegill sunfish and green sunfish, and other species were rescued from "death" ponds and drying streams and placed in live waters. The second year the number of rescued fish jumped to a total of five million.

And, according to Neale, the number has been increasing as the volunteer interest in the work has increased. Sportsmen now realizing the importance of rescue work are more willing to assist, he said.

This year is an exceedingly important year for fish rescue work, Neale said, and during the month of May a total of 1,697,919 fish were rescued in the Sacramento Valley. These fish due to the hot weather and transportation facilities were taken to the nearest live water and released.

TROUT RESCUED EARLY

Fish rescue crews from the Division of Fish and Game are, literally, being swamped with work in various parts of the State. The fish rescue and reclamation work is directed by George Neale and comes under the supervision of the Bureau of Fish Culture.

A very large percentage of the rescued fish are of the spiny rayed tribe of fresh water game and food fishes, black and striped bass, crappies, calico bass, sunfish and several kinds of perch, catfish, etc., none of which can be or are propagated artificially as are trout and salmon.

This year, however, the drought has created many exceptions to the general rule and it has been necessary to rescue members of the trout family very early in the season. Monterey County has afforded a striking example.

Game Warden William F. Kaliher of Monterey, and a crew of workers have been very busy removing stranded steelhead to live waters. To date they have saved nearly 10,000 of these fine trout.

The crews net the fish out of the "dead" pools, place them in water tanks where they can swim about and haul them to live waters near the mouths of the streams.

In reporting on the work, Kaliher said, "We often run into pools that are too rough and deep to work, then we chart the location and return later, when the water is lower, and save the trout."

It is safe to predict that hundreds of thousands of fish will be rescued before the dry season is ended.

MANY FOOD FISH RESCUED

One of California's most characteristic game fish species long headed for extermination was given a new lease on life in July through the activities of George Neale, head of the Bureau of Fish Rescue.

Low water conditions in Lake Chabot, municipal water supply for the city of Vallejo, necessitated the rescuing of thousands of perch and black bass. When the seining operations of the fish rescue crew were started, it was found that Lake Chabot contained large numbers of adult Sacramento perch, the only native spiny-rayed freshwater game fish in California. In addition to over 2000 fish of this species averaging from three to four pounds in weight, 746 large-mouth black bass of the same size were rescued.

The fish taken from Lake Chabot were transferred to iced tanks in retaining ponds near the city of Sacramento where they will be held until they are introduced into other waters.

The Sacramento perch has long been considered practically extinct in California waters. The nature of the spawning habits are such that it can not exist in water occupied by catfish or carp. The female fish deposits its eggs in long bead-like strands upon the branches of submerged vegetation. Other spiny-rayed species build nests in the sand and before the eggs are hatched, both parents fight off intruders from the nest. The suspended egg of the Sacramento perch makes it an easy prey for rough fish in the streams.

The 2000 adult Sacramento perch are to be introduced into two clear, cold freshwater lakes in Sacramento County especially provided for the purpose. These lakes contain no other fish life and an abundance of fish food. It is hoped that with this breeding stock, propagation methods can be carried on which will result in the rehabilitation of this species throughout the waters of this state.

The gamy habits of this species and the white, flaky meat make it a highly desirable inhabitant of the waters of the Sacramento and San Joaquin valleys where it was once abundant.—Leo K. Wilson, 510 Russ Building, San Francisco, California.

FREAK FISH COMMON

One doesn't always have to go to a circus to see the freaks of nature. Several double-headed trout were recently hatched at the Yuba river hatchery of the Division.

To the general public this probably is something, but, according to J. H. Vogt, assistant to the chief of the Bureau of Fish Culture, it is just another common occurrence. As a matter of fact many types of freak fish are apt to appear in large hatchings of fish eggs; this is especially true in California where the State raises from thirty to forty million trout in a season.

In hatching methods, Vogt said, the eggs are placed in screen baskets and suspended in troughs of running water. The hatchery must be located on a stream where the water is well aerated and of an even temperature.

Attendants constantly watch the eggs as they develop and make sure that the infertile ones are removed, he said, and after about 40 or 60 days, depending on the temperature of the water and varieties of trout, the young fish appear.

These young fry live on a yolk sac attached to the underside of the body. It generally takes several weeks for the fish to absorb this sac. When they start to swim against the current it is time to start feeding them prepared liver and milk.

Vogt said that the freaks generally appear during the yolk period. They seldom live beyond the first stages of growth and are removed from the troughs during the cleaning up process.

TROUT SPAWN MANY EGGS

How many eggs will a trout spawn during its life cycle?

This question has been a perpetual source of argument among anglers and it probably will always be a topic of campfire discussion.

To begin with trout regeneration is regulated by many complex factors, according to W. H. Shebley, chief of the Bureau of Fish Cul-

ture of the Division. He has spent many years in fish culture work and has made a deep study of the subject.

Among the factors regulating the spawning activities of trout are the species of fish in question, climatic conditions, stream temperatures, food supplies, stream conditions, seasonal variations, health conditions and many other reasons, the fish culturist said.

In speaking of any particular variety the hearty rainbow trout can be taken for an example. This species is very sturdy and also very popular among sportsmen.

Under ordinary conditions the rainbow trout will mature in from three to four years. Its life cycle is generally completed in about ten years, according to Shebley.

The first spawning, say at four years of age, will bring forth about 600 eggs. As the trout grows larger and more mature the number of eggs spawned will increase until a limit of about 2000 eggs is reached in a season, the culturist said.

"Of course, you must understand that these figures are just estimates based on the assumption that all conditions are ordinary and normal," Shebley said.

It is figured that the rainbow trout has a spawning life of about six years and that she will deliver about 10,000 eggs in that time, he said. Some fish may grow to an older age and produce more eggs and some fish may die earlier. It is an extremely complex problem, and one that is constantly being studied at the various State hatcheries.

FISH HUBBY GOOD NURSE, BUT BABES SOON GO BYE-BYE

At least one species of fish wife has a "nest" in which to lay her eggs—thanks to perhaps the most thoroughly domesticated hubby on record.

At around this time of the year the black bass husband sets to work building a nest for his prospective family of from 2000 to 10,000 youngsters, according to a bulletin of the American Game Association.

He prepares the nest by fanning away from the spot selected all unwanted material. Larger obstructions he removes with his mouth.

After the eggs are deposited the male stands guard over them, never leaving for a moment and constantly fanning the nest to keep it free of sediment, until the tiny fish appear sometimes many days later. During this period he is so ferocious he will attack any kind of intruder.

When his multitudinous offspring are only a few days old, however, they swim beyond his parental control and enter upon a wayward life which soon makes most of his watchfulness go for naught as far as anglers are concerned. The little fish which grow faster than the rest promptly begin devouring their brothers and sisters, and very few bass reach maturity.

Guarding bass are easily caught, and when taken from the nests the eggs for which they died are invariably destroyed by fish, terrapins and other enemies.

Fish experts so far have been unable to devise a method for propagating black bass artificially in fish hatcheries, where other popular game fish are reared by the millions to restock depleted waters. For this reason nearly all states where bass are found are now carefully promoting natural replenishment with closed fishing seasons and spawning refuges.

TROUT LIVES 19 YEARS

How long will a trout live?

Perhaps this is not a very fair question because of the numerous varieties of trout, diversity of conditions in localities, endurance qualities of the species, changes through evolution and a host of other vital, technical reasons.

Therefore, to amend the question—What is the age record in California for any species of trout under any conditions?

W. H. Shebley, noted culturist in charge of the Bureau of Fish Culture of the Division, declares that he raised a Dolly Varden trout at the Shasta trout hatchery and caused it to live for 19 years. His records prove his authority.

According to Shebley the fish was hatched in the year 1898. He was in charge of the hatchery—it is the largest trout hatchery in the



Fig. 126. A Dolly Varden trout lived to be nineteen years of age at this, the Shasta hatchery. This is the largest trout hatchery in the world and one of the finest. The photo shows the rearing ponds and Mt. Shasta in the background. Photo by E. S. Cheney, July, 1928.

world—at that time and started the experiment which was to end in the year 1918 when word was sent to him at Sacramento that the veteran Dolly Varden was dead from natural causes.

The fish weighed between thirteen and fourteen pounds at the time of death and showed various outward signs of old age, according to the culturist. He said that it was the oldest trout of its kind upon which he had any record.

Shebley also revealed that this trout produced between 20,000 and 30,000 eggs during its lifetime. When it is considered that a great majority of these eggs hatched and produced fish, this one Dolly Varden was a very valuable asset to the natural resources of the State, he said.

FISHING AS AN ESCAPE

Fishing offers rather the same escape from the troubles that infest the day as does the reading of a detective story. In both cases the occu-

pation is a focusing of the attention on something quite apart from the self. The angler is intent on his line, the reader is intent on his crime.

Probably the brain worker turns to fishing for several reasons. He may simply like to fish; or he may need air and sun without too much exertion, since brain workers are proverbially underexercised; or he may find in it distraction from thinking.

Personally, the thinking I do while fishing is purely and solely about fish. Are they here? Shall I move there? To me fishing is a philosophy rather than a sport. I hold no brief for competitive fishing; the biggest fish, the most fish, mean nothing to me. I know no envy, and I know only one resentment—the useless killing of brave big fish which are merely trophies.

In pursuance of my philosophy, it is almost enough simply to be fishing. Almost, not quite. I want a fish now and then. Not any furious desire for fish defeats my purpose, which is primarily a sense of peace. I do not think about peace, I merely feel it. I think about my line, deep in the sea, or the fly, badly cast to a pool in some mountain brook.

And the surface of the water becomes mysterious to me, covering the things I can not see. If I think at all, it is about those things I can not see.

One day at the ranch I went fishing up the canyon. I sat all afternoon and caught no fish. When twilight fell I was still there, out on a rock in the roaring stream; and a cowboy on horseback on the trail above, unable to make me hear, had to shy a stone into the water to attract my attention.

"Hey!" he shouted. "Don't you want any supper?"—Mary Roberts Rinehart.

BOYS' CLUB HELPS SAVE FISH

Here is an interesting bit of fish conservation news that was submitted for this issue by a San Francisco sportsman.

Recently, at a Campfire of the San Francisco Boys' Club, on the Noyo River, President C. W. Marwedel recited to the boys the radio talk of one of the members of the Fish and Game Commission, in which it was related that in a test of some ten water snakes caught in an afternoon in one of our streams, nine were found to contain young fish, in a number of instances as many as 30 to 35. He called attention to the beautiful stream on which their camp is located, and the pleasure many of the boys had derived in catching trout. "Boys," he said, "let's get in and save the young fish in our stream. I will give a bonus for catching the water snakes, and if you will bring them to my tent at the siesta hour, at noon, and again in the hour after dinner, I will pay five cents for each large water snake, and the same for two medium and three small."

For the next two days, President Marwedel was busy paying for snakes, and in all one hundred and ninety-seven were caught and $4.50 paid out to the snake hunters.

President Marwedel promises to continue the hunt and rewards each year in the week in which he is in camp.

FEELING WARM? THEN PITY THE LITTLE FISHES

If you could change yourself into a fish, you still wouldn't be able to escape the heat. Finned fanners of liquid depths have their heat

wave worries, too—in fact, more than city dwellers, and largely because of them.

Not only are fishes extremely sensitive to temperature variations, and devoid of all comforting "fans" except an occasional outboard motor propellor—whenever people start saying they are "just about to suffocate," fishes by the thousands are actually suffocating.

Thus blasting a popular summer-time fancy, officials of the American Game Association have announced that high temperatures combined with unusually low water levels are already taking a huge toll of valuable fish life. Bodies of water whose contributing streams have dried up, due to a continuation of drought conditions, are losing their supply of oxygen.

Rescue squads are already at work in California, Montana, Wisconsin, Missouri and other states. More than a million fishes were saved in each of these states last summer, the first season of extreme oxygen "depression." Outboard motor boats were used on several lakes as an emergency relief, to disturb the water so that it would absorb more oxygen from the air.

The Wisconsin game and fish commission has found that fish are dying in greatest numbers from the heat in waters which are most heavily polluted with the untreated sewage poured into them by cities, towns and villages, the officials reported.

Although an estimated 85 per cent of all the waters in the country are sufficiently polluted to be dangerous to fish and human life the year round, they said, hot weather aggravates the condition. Heat hurries decomposition, increases the poisons in the water and causes the loss of a greater amount of oxygen.

RECKLESS MOTORBOATING HIT BY NEW STATE LAWS

With outboard motors apparently turning every known variety of aquatic craft larger than a waterbug into speed boats, three states have recently passed laws to check reckless driving on their waters, says a bulletin of the American Game Association. New laws in Michigan and Pennsylvania authorize officials to silence, slow down and otherwise regulate motorboats as being unnecessarily dangerous to bathers, obnoxious to waterside residents and destructive to valuable aquatic life and fish spawning beds. The Indiana legislature forbade the operation of any motor craft on lakes smaller than 325 acres between April 1 and June 15—when fish are spawning—and restricted the speed to ten miles an hour at other times.

HOW TO PRESERVE TROUT

Many pounds of fine trout are wasted every year because anglers do not know how to preserve the catch. By proper handling it is possible to keep the fish in excellent condition while traveling far distant from mountain streams. Following are a few suggestions as offered by the Division on the art of preserving fish.

Clean fish as soon as possible, wash and hang up to dry out. Do not put any more water on them. Hang outside at night. To keep trout several days before taking home, lay out over night to drain, then pack good in willow boughs or sod grass, a layer of fish and a layer of grass. Roll them up during the day in a damp gunny sack and lay out each night to air and cool.

Another method suggested is to wrap each fish in silk paper after cleaning and drying, then roll in a dry sack or piece of burlap, and wrap again. The extreme outer sack may be wet, then carefully wrung out, and roped around the dry bundle. Keep in a cool place away from the air, inside if possible. Tie the bundle at the ends much the same as a tamale is tied. Do not open until the fish are to be used. Such bundles have been shipped in a box with ice for thousands of miles.

The theory of saving trout is to keep them cool, clean, dry and away from the air.

If fish are to be shipped in ice, this method is suggested: Put a lot of green grass blades or similar material in the bottom of the container, and after wrapping each fish separately in more green material and all are packed in, put a batch of green material on top. Put paper on top of fish letting paper down over sides of box. Then put in ice broken in small fragments to the depth of from four to six inches, fold paper back over ice, put more paper on top, nail on cover, and mark box, "Perishable, This Side Up." The paper will exclude the air and the ice melting very slowly will trickle down through the packed fish.

COMMERCIAL FISHERY NOTES

NEW SALMON LAWS

Many inquiries are coming to the Division relative to the salmon laws. Here is a short review of the amendment to the salmon law, approved by the State Legislature and signed by Governor James Rolph, Jr.

The principal changes are in Section 634 and include: a size limit of 27 inches on chinook salmon, and 24 inches on silver salmon that may be taken, killed or held in possession in districts 6, 7, 8, 9, 10, 11, 15, 16, 17 and 18.

A new provision requires that all salmon under legal size caught, accidentally or otherwise, must be landed by means of a landing net or scoop net and returned to the water unharmed. It is unlawful to operate any salmon trolling boat not equipped with landing nets or scoop net, or to gaff, club or injure any salmon under legal size.

It is also provided that in districts 6, 7, 8 and 9 the open season shall be between May 1 and September 15, and no salmon may be brought from the high seas through these districts between September 16 and April 30.

In districts 10 and 11, the open season is from May 1 to August 15, and no salmon may be brought through these districts between August 16 and April 30.

In districts 15, 16, 17 and 18 the open season is from April 1 to June 30, and no salmon may be brought through these districts between July 1 and March 31.

A new commercial district has been created by taking the upper portions of the Sacramento and San Joaquin rivers out of district 12b and creating district 12c. In district 12c the salmon season will be closed from June 16 until November 14, both dates inclusive.

STATE RIGHTS UPHELD BY COURT

The United States Supreme Court dismissed the appeal of Charles F. Noack and others vs. the Fish and Game Commission, which case went up from a decision of the District Court of the United States.

The original suit filed by Noack was dismissed by Judge Kerrigan on the ground that a court of equity would not interfere with the enforcement of criminal statutes. The fishermen then amended their petition, averring that section 634 of the Penal Code was unconstitutional on the ground that it was repugnant to the commerce clause of the Federal Constitution; that it denied them equal privileges and due process of law, and that the statute assumed admiralty jurisdiction.

The decision of the United States Supreme Court, in dismissing this appeal, upholds the right of the State to prohibit by proper legislation the importation of salmon caught on the high seas over or across any fish and game district when such district is closed.

THE EFFECT OF HADDOCK FLESH AND SKIN ON GASTRIC JUICE*

It has become popular knowledge that fish are more easily digested than beef or other meats. The reason has been found to be that some part of the fish induces a more active secretion of gastric juices. The present experiment shows that the skin of the fish is the most important agent, causing the flow of juices to increase from $\frac{1}{3}$ to $\frac{1}{2}$ more than fish flesh. The juices resulting from the stimulation of the agent in the skin is more acid than that caused by the flesh.

"These experiments are also of value for dietetics, for in all cases where it is necessary to cause a greater gastric secretion (as in convalescents, and in functional depression of gastric activity) fish with the skin on or broth from fish with the skin (small fish may be used for this purpose) may be recommended. In cases of excessive secretion of gastric juice (hypersecretion), or of gastric or duodenal ulcers, the flow of acid gastric juice on the food must be diminished, the taking of fish skin or bouillon from it must be avoided, but the haddock flesh without skin is then quite suitable food."—Paul Bonnot, July, 1931.

BASKING SHARKS ON THE PACIFIC COAST

The staff of this station were interested in Mr. E. W. Gudger's account of the capture of a basking shark, *Cetorhinus maximus,* taken on the New Jersey coast near Long Branch, an account of which appeared in *Science* of October 3, 1930. We were interested not because of the strangeness of such a catch, but because so much space was given to an animal which is so common with us that we may see one almost any day during December and January.

Twenty-one of these sharks were sold to the Monterey Fish By-Products Plant, of Seaside, Monterey County, California, between the dates of November 22, 1930, and February 13, 1931, the average weight being 2523 pounds. The largest was 6580 pounds and 28 feet long, the smallest 900 pounds and 15 feet long. The largest shark sold to the above firm at any time was a few inches under thirty feet and weighed 8600 pounds. The liver of this shark weighed 1800 pounds, 60 per cent of which was oil.

* Progress Report No. 2, Atlantic Biol. Sta. and Fish. Exp. Sta. Biol. Bd. of Canada. April, 1931. Note No. 5. B. P. Babbin.

Because this fish feed directly upon plankton, the oil is clear, odorless and tasteless when carefully prepared and, in the writer's home, has been substituted for commercial cod-liver oil purchased at drug stores.

Little is known regarding the migrations of this shark on the Pacific Coast; in fact, little is known about it at all. It is a cold water form (which would be obvious because of its use of plankton for food), but it has been seen in numbers at different times of the year as far south as San Simeon Bay, California, and there are records of its having been taken at both San Pedro and San Diego. A 2000-pound specimen was taken here at Monterey Bay, May 19, last year; and another, 26 feet long, 6200 pounds, September, 1928; so apparently they occur all the year, but are most plentiful during December and January.

The reasons more of these sharks are not taken are that the price paid fishermen is only $2.50 per ton, and the animals are so difficult to handle that fishing crews do not feel justified in equipping their boats for taking them.

They are now used entirely for fertilizer or chicken feed, the liver oil being used in the preparation of the latter. No doubt *Cetorhinus* will be taken in increasing numbers when the real value of the oil is appreciated as a substitute for cod-liver oil.

Two parasite copepods, *Anthosoma crassum* and *Denemature producta*, were taken from the 6200-pound specimen.—G. E. MacGinitie, Hopkins Marine Station, Science Vol. 73, No. 1897, May 8, 1931, page 496.

THE 1931 TUNA CATCH

Yellowfin tuna and skipjack fishermen have not had a successful fishing period since the voluntary cessation of fishing during December, 1930, and January, 1931. The demand for the tunas did not revive, and as a result of an agreement between the canners and fishermen, another recess of fishing operations was declared for each tuna boat for 60 days (during approximately May and June). Even after this tie-up, very few boats went fishing until the middle of July or the first of August. The price was lowered to $100 per ton for yellowfin tuna, and $60 for skipjack, $40 to be paid upon delivery and the remaining $20 December 1, 1931, provided the price had not been lowered in the interim.

Early in June the canners wanted to lower the price of bluefin tuna from $110 per ton to a lower figure, their reason being that the price for the packed fish did not provide a profitable margin. After much discussion, which lasted until the latter part of June, the canners and fishermen came to an agreement whereby the latter were to receive $45 per ton upon delivery, and the remaining $45 on or after September 15, 1931, if the price had remained constant during this period. The disagreement over the price, coupled with an apparent scarcity of fish has resulted in an exceedingly small bluefin tuna catch for 1931.—S. S. Whitehead, August, 1931.

PERMANENT QUARANTINE ON CLAMS AND MUSSELS

The State Board of Public Health, at its regular meeting held in San Francisco, April 11, 1931, established a permanent quarantine upon clams and mussels during the months of June, July, August and

September of each year. This quarantine covers the entire California coast from Monterey County to the Klamath River in Del Norte County, with the exception of the Bay of San Francisco.

Under the provisions of this quarantine order, the sale or offering for sale of clams and mussels gathered from the specified territory during the months of June, July, August and September of each year is prohibited.

FISH TAGGING EXPERIMENTS DEVELOP

The U. S. Bureau of Fisheries has tagged 1600 weakfish and smaller numbers of cod, scup, sea bass, and flounders at Wildwood, New Jersey, Woods Hole, Massachusetts, and elsewhere along the North Atlantic coast. The tag used consists of two celluloid disks attached near the tail of the fish by a silver wire. In addition to the disk tag, several fish have been tagged by putting a narrow celluloid strip, bearing a number, inside the belly cavity of the fish. Fishermen and others finding either of these types of tags are requested to send them to the Commissioner of Fisheries, Washington, D. C., together with information concerning date and locality of capture. A reward of $1 will be paid for each tag returned with complete data concerning it.

All persons who are holding small metal strap tags attached to codfish are earnestly urged to send them either to the Commissioner of Fisheries or to Mr. W. C. Schroeder, Museum of Comparative Zoology, Cambridge, Massachusetts. The tags, either the disk or the strap type, will be returned on request to those who wish to keep them as souvenirs.

The cod tagging experiments during the late summer of 1930 in which disk tags were tried out in comparison with the metal strap tags have proved particularly interesting. Apparently, as a result of the use of the disk tag, an unusually large number of tags were reported within the period of January 20–February 24.

The returns to date from 171 cod marked with celluloid disk tags at Woods Hole, January 8-9, 1931, amount to four fish, taken between Block Island and Barnegat, New Jersey.

There are now 11 recaptures reported from 133 cod tagged on Nantucket Shoals in October, 1930, with disk tags, a few of them with belly tags. All these fish were taken between Block Island and southern New Jersey. This return of 8.3 per cent compares with previous returns of 0.5 to 1.31 per cent from about 25,000 cod marked on the Shoals from 1923–1929.

Although only 16 of the 133 cod had belly tags (in addition to disk tags) four of these have been reported recaptured; of these four, two of the belly tags apparently were overlooked, one was returned without mention of disk tag, and one was returned by the purchaser of the fish from which the disk tag was taken by the fisherman making the catch. Thus, two separate records were received for the same fish.

No returns have been received from 68 cod marked with metal tags on Nantucket Shoals the summer of 1930 and none from 169 fish marked with metal tags at Woods Hole, January 8–9, 1931.

The celluloid disk tag has produced decidedly better results thus far than the metal strap tag in two experiments where both types could be directly compared.—*Fishery Science and Trade*, Vol. 3, No. 3, March, 1931, p. 16.

CLAMS PLENTIFUL

Clamming at Moss Landing and the mouth of the Salinas River was reported to have been quite good during the early part of March. This is said to have been due to the rough surf which brought the shellfish in from the outer bar. There is understood to be a good supply of clams fairly well out at all times, but they can not be reached there by diggers.

FISH LANDINGS AT NORTH PACIFIC PORTS

Bureau of Fisheries (U. S.) Statistical Bulletin No. 915 shows that during January, 1931, 37,100 pounds of fishery products, valued at $2,382 were landed by American fishing vessels at Seattle, Washington, compared with 206,500 pounds, valued at $12,892 for the same month a year ago. This is a decrease of 82 per cent in amount and 82 per cent in value. The receipts of Seattle wholesale dealers by other than halibut fishing vessels, but not including products received from Alaska and Canada, amounted to 164,952 pounds, valued at $10,269 as compared with 191,298 pounds, valued at $12,571 for the same month a year ago. This is a decrease of 14 per cent in amount and 18 per cent in value.

No halibut were landed during January, due to the closed season in the halibut fishery.—*Fishery Science and Trade,* Vol. 3, No. 3, March, 1931, p. 19.

CAUGHT BIGGEST CLAM

A clam that weighed six and a quarter pounds was brought to town today by Jimmie Guthrie, well known fisherman and publicist of Harker's Island. The clam was caught at Cape Lookout along with several others of very large size.—Beaufort, N. C., *News.*

CRABS REAL HOME LOVERS

When you gaze at the hard exterior of a crab, shed a tear, for he may be homesick. Though they walk sideways, and slowly, crabs taken away from home will travel miles to get back. So declares a British government report on crabs, which has just been issued. Some crabs, taken from Spurn Head, in Yorkshire, and released along the Lincolnshire coast of England, at once started for home. Twelve of them were later caught near their birthplace, having traveled from 12 to 35 miles. Some went on to Filey, one actually crawling 75 miles measured in a straight line, and perhaps hundreds of miles as the crab walks.—*The Fish and Oyster Reporter,* May, 1931, p. 17.

CONSERVING WHALES IS WHALE OF A JOB

A few years more may make a whale of a difference—to whales, predicts A. Brazier Howell, executive secretary of the Council for the Conservation of Whales. Unless protected from destructive whaling practices these unique creatures—largest mammals on earth, inhabiting the water like fishes—will soon disappear from the United States' Alaskan waters and elsewhere, he has informed the American Game Association.

After failing to secure legislation in the last session of Congress regulating the taking of whales, the council launched its 1931 program with a hearing before the Senate's Special Committee on Wild-Life Resources. At this the council's technical committee described the condition of whales and whaling as "perilous."

UPLAND GAME BIRDS

HAIL TO THE KING!

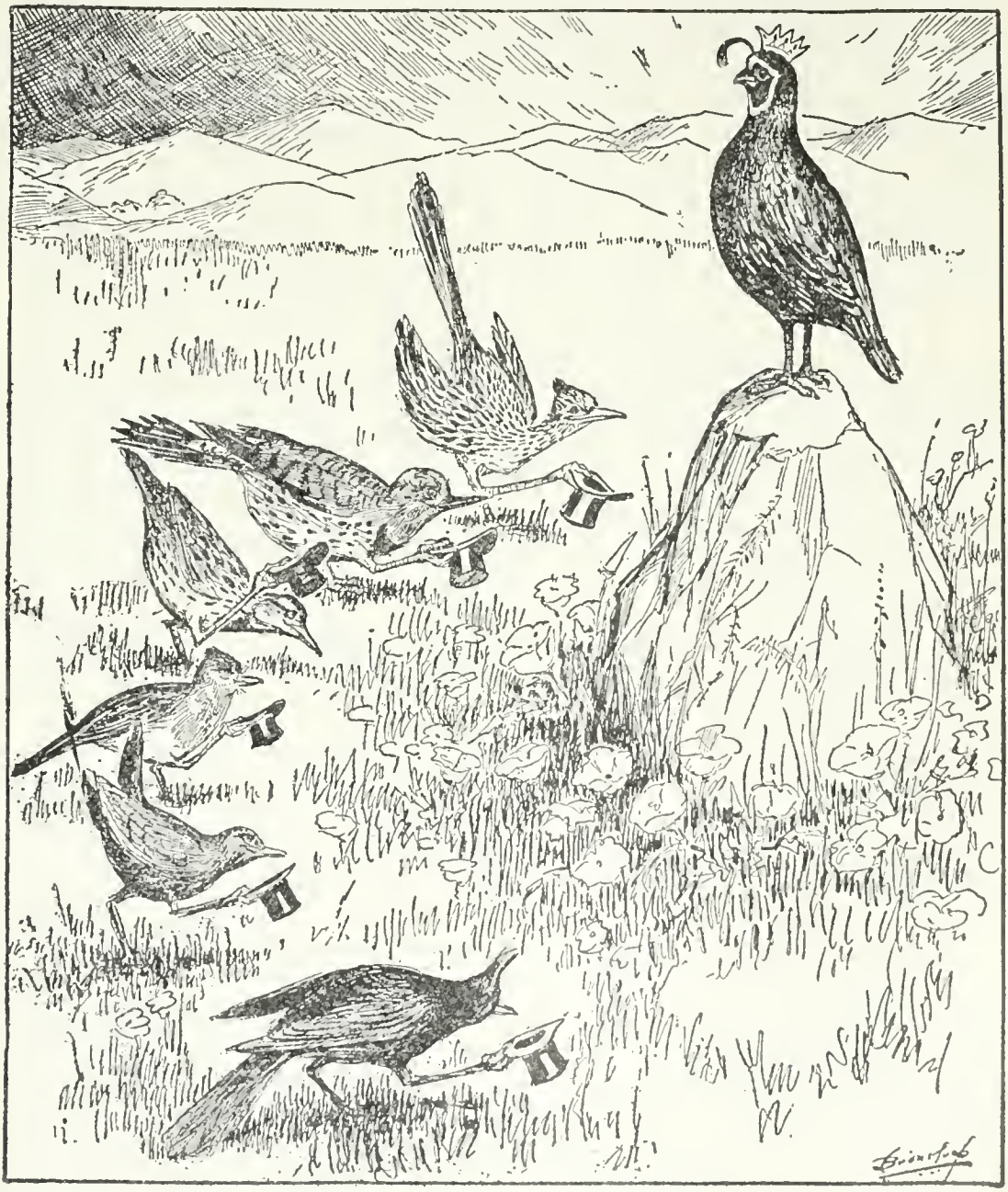


Fig. 127. California quail is now the real authorized State bird. Here we see some other native birds doffing their Sunday silk-tops to the new king. Drawing submitted through courtesy of *San Francisco Chronicle*, April 6, 1931.

CALIFORNIA'S STATE BIRD

Choice of the valley quail as California's official representative is hard to criticize, even though many fine birds, both attractive and distinctively western, have been nominated for the accolade. The legislative committee has made an appreciative decision.

Aristocratic, distinguished, spirited, with beautiful manners and a pleasant voice, the valley quail is a fine cavalier in a State whose traditions run back to cavaliers. And who does not know him, this gallant figure that treads city parks as bravely as the desert paths? He is everywhere throughout the State except in the darkest forests and on the highest peaks—an essential element of the California scene.

Some of the others were hard to pass by—the colorful western blue jay, equally characteristic of the California hills, though, it must be confessed, deficient in manners and voice; the western kingbird, uncompromising foe of all robbers and oppressors, surely as spirited a bird as ever lived; the gay, melodious and ever-charming meadow lark, he who finds every season appropriate for optimistic song; the water ouzel, modest and retiring, but, when his acquaintance is made, a prince among birds.

These and many another could have worn the crown with credit, but surely none can deny the full merit of the valley quail—the living spirit of California.

INCREASE IN SUPPLY OF QUAIL

In the effort made during the past year to reestablish the supply of native quail by the establishment of quail sanctuaries and through natural channels from the nucleus of wild birds in the fields, it may now be recorded, with sincere thanks to the interest and activity displayed on the part of many of the volunteer deputies, coupled with the cooperation of the landowners, farmers and ranchmen, about 1000 inviolate quail sanctuaries and game refuges have been established within the State.

These sanctuaries contain upwards of 600,000 acres of land, upon which it is estimated there are about 300,000 wild valley and mountain quail.

Reports received from deputies during recent months indicate that in spite of this being a dry year, late and cold rains, and cloudbursts in some sections of the State, the quail have bred well, the broods of young birds are large, and that there is a noticeable increase in the supply of quail to be seen on the sanctuaries in every part of the State.

During the past six months the volunteer deputies have destroyed the following number of predatory birds and animals: 38 coyotes, 43 coons, 33 bobcats, 549 house cats, 89 skunks, 35 foxes, 8 weasels, 5 wild dogs, 2 opossums, 1 badger, 307 magpies, 3722 bluejays, 81 crows, 365 sharp-shinned and Cooper hawks, 49 butcher birds, 2 great horned owls and 47 snakes.

CATALINA CATS AND QUAIL

In a report received from Herbert M. Sangler, volunteer deputy, it is revealed that there are quite a number of quail on Catalina Island, but the birds do not seem to increase from year to year in large numbers.

"This is due to the fact, I believe, that there are so many stray and homeless cats which roam the island in search of food," he said.

"Since January 1, this year, 110 cats have been trapped. Fish scrap is used for bait. The number of cats shot and killed is not known."

He also reported that many cattle, goats and horses roam over the island and probably destroy many of the quail nests. The report also stated that dove are not plentiful on the island, due, in part, to the same reasons that effect the quail supply.

PHEASANT EGG RECORD

Excellent spring weather is aiding in the establishment of fine records at the State game farm at Yountville. During the week ending April 3, 2347 ringneck pheasant eggs were produced, and this is the greatest record in the history of the farm.

The first shipment of the season went forward to E. W. Smalley, captain of patrol at Hanford. It consisted of two cases totaling 576 eggs.

In referring to conditions, Farm Superintendent August Bade said: "Our incubating capacity is full at the present time, so that is the reason we are sending out these early eggs into districts that have early warm weather. By the time we have these districts supplied, it will be time to help other places where the season is later."

A delegate of the Sonoma County Sportsmen's Association visited the farm and made arrangements for the handling of about 1000 eggs. The clubman announced that the eggs would be hatched and brooded by the association and that the birds would be used for stocking purposes.

PHEASANT POPULATION GROWING

The pheasant population at the State Game Farm at Yountville, operated by the Division, has failed to hear any of the talk of depression, according to figures submitted in July by August Bade, superintendent.

During the laying season, the ring-necked pheasant hens on the game farm produced a total of 40,069 eggs, or an average of 66 eggs per hen during the period. This is 16 eggs per hen above the general average usually figured by game breeders as the season's production.

A large majority of these eggs were hatched in the incubators at the game farm and young birds are now ready for distribution to many sections of the state.

PHEASANTS RELEASED ON SCHOOL PROPERTY

The following interesting news was received from the Viking Print Shop of the Voorhis School for Boys at San Dimas:

"It is no uncommon sight now to see a brilliant cock pheasant proudly escorting three or four hens of his tribe about the school grounds, especially since the release on June 26th of 96 additional pheasants on the athletic field by the State Game farm.

The new birds are ringnecks. The largest part of them were hens about 16 months old which had been laying eggs for the incubators at the game farm at Chino. Some of them had laid as many as 80 eggs, it was said, but their laying period was ended, largely due to scarcity of suitable feed. The man who delivered the pheasants said that because of the change in feeding ground and the freer range here they would probably soon begin to lay again.

An interesting phase of the release of the birds was that almost without exception they flew vertically into the air as soon as the cage was opened, to a height of about thirty feet before starting off in horizontal flight."—H. H. C.

PHEASANTS DO NOT KILL BABY RABBITS

The cocky ringneck pheasant, blamed for many depredations, is absolved from the belief that he and she kill young rabbits, according to findings of officials of the Pennsylvania Board of Game Commissioners.

These officials observed hundreds of rabbits, varying in size from six inches to adult, in all the fields at the state game farms. On no occasion have the officials or any of the helpers seen pheasants molesting the young rabbits, some of which even entered the pheasant coops, a bulletin of the American Game Association announces.

BOOMING NOTE OF GROUSE

One of the most argued questions among old timers in the mountains of California is the method used by the cock grouse in calling to his mate. There is no more familiar sound in the yellow pine belt of the mountains of California, between 4000 feet and 7000 feet, than the booming note of the grouse, chiefly during the months of May and June.

Many and various are the statements made as to the way in which the mating cock grouse produces the booming call. Some old-timers are willing to swear that he stands on a hollow log and beats his wings in such a way as to make the noise. Others have stated that it is made by swelling out the membrane on his neck, thus increasing the volume of his crowing. Others have stated that it is made by the beating of the wings against his body.

There is one thing about which all old timers and naturalists agree, and that is that the sound is difficult to locate, and it is impossible to tell whether the bird is within a few yards or a mile or two away.

How rare it is to see one of the cock grouse performing his antics and producing his mating note may be judged by the fact that Assistant Superintendent Guy Hopping, of General Grant National Park, has lived in the mountains of the Sequoia and General Grant Parks for over 30 years and has only once seen a cock grouse preforming his evolutions. Colonel John R. White, Superintendent of the Sequoia and General Grant National Parks, was 11 years in the mountains before he saw the cock grouse at its game. Colonel White recently returned from an inspection trip to General Grant Park, and it so happened that he left Ash Mountain headquarters in Sequoia National Park at 5 a.m.; and in the early morning, while on the Sand Creek Road between Pinehurst and Grant Park, he had an exceptional opportunity to see a cock grouse drumming. Colonel White first saw the bird a few feet ahead of his car and was astonished at the brilliant mating colors, thinking at first that it was a Chinese pheasant or some imported bird. The brilliant yellow membranes on the neck were especially prominent, as was the scarlet comb. The cock grouse had his tail up like a peacock and feathers all puffed out, so that he looked twice his usual size. Colonel White stopped and

watched the grouse strutting along the road within ten feet of the car. The bird then flew to the bough of a yellow pine below the road, so that the grouse was on the level with the car and less than fifty feet from it.

The grouse then began to walk up and down a small limb, strutting and preening himself. Soon began the mating call, which appeared to come from the mountain above the road, and might have been half a mile or more away. However, by watching the bird it was clear that a faint noise was audible every time he puffed himself out and swelled the neck membrane. This noise synchronized with the boom that was echoed back.

It is clear that the noise is made only with his throat, and that the swollen neck membranes act in a ventriloquial manner to carry the sound and echo it back from a near by mountain.

Assistant Superintendent Hopping made the same observation many years ago, so that two old timers foregathered at General Grant Park and settled a much mooted question of the natural history of the Sierra Nevada.

THE LAST HEATH HEN

The Division of Fisheries and Game in Massachusetts reported, during July, that the last heath hen—a male—lives near the farm of James Green, in West Tisbury. Green is doing all in his power to protect this "last" bird and after it dies a natural death he is going to ship the remains to some natural museum.

On its reappearance last spring the bird was captured in a net trap and both legs marked with numbered metal bands. The bands will serve to identify the last heath hen in case it falls prey to natural enemies—and will serve notice that the heath hen has joined five other American birds now extinct.

Like the extinct passenger pigeon, countless thousands of heath hens once occupied this section of the country. They were slaughtered in great numbers, almost to the vanishing point, before protection was provided. In February, 1925, there were twenty-nine specimens on Martha's Vineyard and bird lovers hoped reproduction might save the breed. Then some one discovered that the birds were all males. Four months later there were only eight survivors.

The late Edward Howe Forbush, noted ornithologist, and many others, spared no effort to save the species. Dr. Alfred O. Gross, of Bowdoin College, who is also interested in protecting the partridge, or ruffed grouse, said of the heath hen: "How long this bird will live no one can safely predict, its going is inevitable, but ornithologists, bird lovers and sportsmen the world over will have the satisfaction of knowing that all possible was done to save the species from extinction. The State Department has assured us that the bird will be allowed to live and when death comes, whether it is due to old age, disease or violence, we will at least know that the life of the last heath hen was not wilfully snuffed out by man."

But further than that, Dr. Gross sorrowfully admits, nothing can be done about it. Science has contemplated reproduction of animal species without the male, but is helpless and hopeless without the female.

Perhaps by the time this unwelcome record reaches the press the last heath hen will have joined the growing ranks of the exterminated species. Surely nothing can be done to perpetuate this unfortunate bird family but the sacrifice may create better cooperative efforts among residents of this continent to prevent the passing of other threatened members of our animal kingdom.

DOVE SURVEY

A survey is being conducted by the Bureau of Education and Research on the dove situation in the State. It is requested that all deputies forward to the bureau, as soon as possible, the names of dependable dove hunters in the various districts. Through this medium it is expected to gather some valuable information for conservation work.

TURKEYS DO WELL

Wild turkeys liberated on Redwood Creek, Humboldt County, last fall are thriving, according to word received from Captain William Lippincott of the Division.

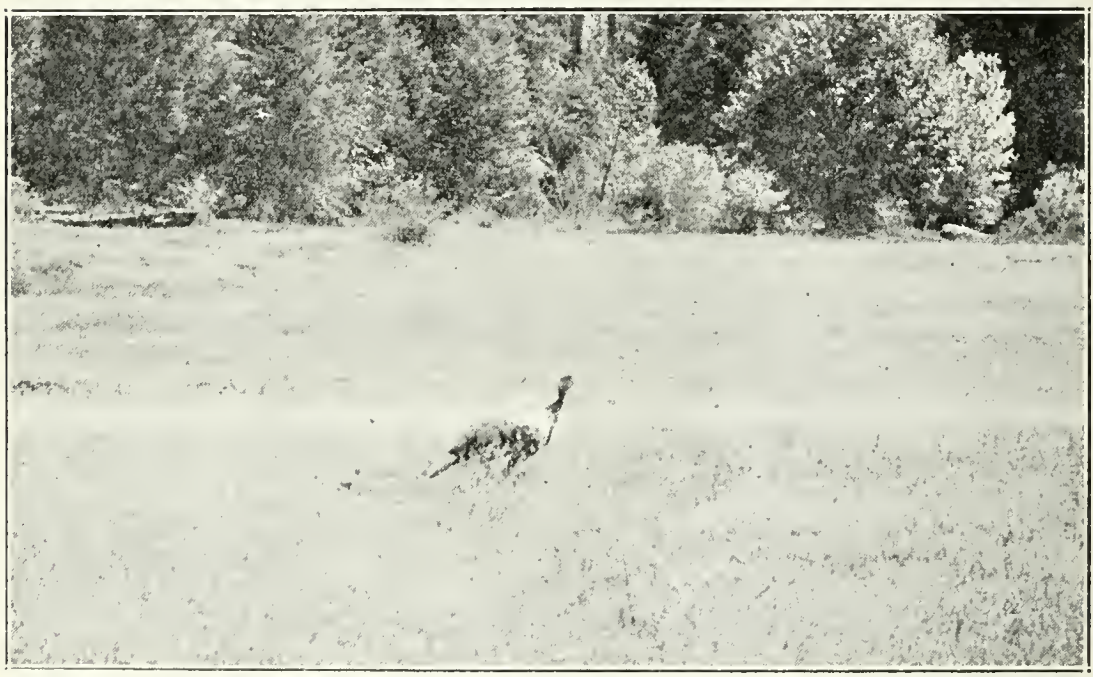


Fig. 128. Wild turkeys are thriving in Humboldt County. Here is one lone bird that strayed far enough from cover to get "shot" by a camera. Photo by William Harp, May 12, 1931.

One hen was found with sixteen young birds, and two other hens were found, one with fourteen young ones and one with ten. Other hens were apparently setting, as they were alone.

Due to the interest shown by those who are familiar with the wild turkey, a number of these birds were imported to the State game farms at Chino, in southern California, and Yountville, in Napa County. The species selected is the Mexican bronze turkey.

August Bade, Superintendent of State Game Farms, said that surveys were made to ascertain if California had much natural territory well adapted to these birds. Some excellent turkey range was found, he said, and efforts are being made to stock these sections.

Captain Lippincott said that patrolling forces are watching the progress of the turkeys in this section very closely. Sportsmen and residents in the locality seem to be very much interested in the welfare of the birds, he said, and indications point to great success with the species.

There is no open season on turkeys in California as yet.

PLANT WINTER FEED TO ASSIST BIRDS

Now is the time to sow patches for winter feeding of wild birds, a bulletin of the American Game Association announces in outlining a few of the better feeds and where to plant them. Fishermen are particularly urged to carry along some of these seeds which can be planted by merely scuffing up the earth with the shoe, dropping the grains and pushing the loose earth back over them. All plantings should be made close to cover, else many of the species of wild birds will not venture into the open to get the food, so great is the hazard from their natural enemies in the air and on the ground, observations show.

Wherever possible stiff stalk seed bearing plantings should be made so that the seeds will be held through the late part of the winter when natural foods are at their greatest scarcity and in greatest need, the bulletin points out.

Among these are Kaffir corn, sorghum and ordinary field corn. Some rape seed should be planted, for the greens from this plant serve as "salad" for the birds, a necessary part of their diet. And this plant is most likely to remain green throughout the winter in nearly all climes.

Corn is thought to be the best food for wintering quail and other birds. Observations carried on throughout several winters in the deep snow country show that quail wintered well on it. Of 106 quail observed that had access to corn, 103 came through a winter, all in fine condition. Two of those lost were killed by predatory hawks; the fate of the other quail is unknown.

It was shown that quail living on corn were strong enough to escape many times from the attacks of predators, only the two luckless ones being taken out of 106, which is considered negligible.

Landowners and farmers are urged to leave patches of cover in fence corners and plant some of these foods in or near them, to help carry the wild birds over the winter.

A fellow who runs a sporting goods store down in Tennessee is GIVING a pound of game bird seed with each box of shotgun shells sold, according to current reports. He is said to be the FIRST man to establish the practice.

DON'T BURN OFF LAND

"The time is fast approaching when burning fields will be recognized as a crime to be controlled by some official agency," in the opinion of Seth Gordon, president of the American Game Association.

"To penalize a man for killing game out of season and then let his neighbor destroy ten times as much with one match, because of his erroneous belief that burning off his land will help his crops, is not at all equitable.

"The many forest fires started by this practice, and its wholesale destruction of game, especially of nesting ground birds in the spring, will not long be tolerated—now that the nation has been awakened to the waste of forest fires and the plight of game."

CRIPPLED BIRD IS LURE TO GOLFERS TO PLAY NEW GAME

At this time of the year a golfer who walks into the rough to locate a golf ball that has strayed from the fairway may be startled by seeing a pair of crippled "snipe" flopping around on the ground. Don't take these poor cripples too seriously, advises the Izaak Walton League in a recent bulletin, because they are quite apt to be killdeers and their inability to fly is a fraud. In recent years these interesting birds have been increasing on golf courses which have one or more water hazards.

The sharp cries of the birds and their antics in displaying "broken" wings are merely invitations to play hide and go seek, because they have a nest or young nearby and they are doing their best to lure the golfer away from the family. Fluttering around with make-believe broken wings usually succeeds in doing this.

It is a good trick and the kind hearted golfer is supposed to play the game and make believe that he wants to catch the crippled killdeers. As soon as he is drawn far enough away from the nest or chicks the adult killdeers will fly away, their wings miraculously "cured."

WATERFOWL

THE DRY SEASON AND DUCKS

There is no doubt that the drought we are experiencing in practically all sections of the State this summer will be reflected in our duck shooting this fall. Not only are breeding grounds more limited in extent than ever before in California, but some areas may be entirely dry by fall.

Reports from the great duck and Canada goose breeding grounds in Modoc, Lassen, Shasta and Siskiyou counties indicate a water supply about one-third normal and many areas formerly marshy and suitable for duck breeding are entirely dry this season. This condition results in a concentration of the birds on sections now having water, with increased danger to the birds from disease and enemies a result of such concentration.

The Los Banos region of the San Joaquin Valley, always an important duck nesting area, is particularly hard put for water this summer. Most of the club grounds in this section, which ordinarily have water on them all summer to grow cattle feed, are now entirely dry, with little prospect of securing water until late fall. In fact, it seems probable that those clubs in this section that do not have their own wells will be without water this fall, until supplied by the winter rains. The result will be little or no shooting for them until well along in the season, less area for the birds to loaf and feed on and concentration of birds on the few clubs supplied with well water. Fortunately our duck refuge near Los Banos is at present well supplied with

water, due to Superintendent Asa McClellan's foresight in conserving his supply, and a large number of ducks are breeding on the property.

The Sacramento Valley will doubtless have water after it is turned off the rice in September. There will be abundant feed for ducks and geese in this valley next fall, with one of the largest plantings of rice ever made in the valley producing a vast feeding area in its stubble and much unharvested barley land available as well. The new duck refuge near Pennington will be operating next season and should assist this section materially in holding the birds in the country.

NEW REFUGE

The Division has just completed the purchase of the Gray Lodge Club, an area consisting of 2541 acres in the lower end of Butte County, for a waterfowl refuge. There has been an annual kill of in excess of 12,000 ducks on this property. This shows that it is an excellent duck locality. The Commission made an excellent buy as the owners have invested more than $100,000 above the purchase price. The work that they have done on this ground is of benefit to the Commission in the use of the land as a refuge. This area will be fenced and operated in accordance with the plans that have been used at the Los Banos refuge.

The Los Banos refuge has proven its worth in many ways. There are hundreds of ducks breeding in that locality at the present time.

A PRICE OF PROGRESS

Joseph Mailliard, Curator Emeritus of the Department of Ornithology and Mammalogy, California Academy of Sciences, recently discussed before the Scientific Research Section of the Commonwealth Club the phenomena of diminishing waterfowl on our western coast.

"No one knows the actual decline in numbers of the shorebirds during the past fifty years," says Mr. Mailliard, "but it is certainly dangerously near 100 per cent. Market hunting alone, destructive as it was, could not have caused so marked a dwindling."

Despite the many reports from gun club enthusiasts there seems to be no question but that ducks are rapidly diminishing. Even on Lake Merritt at Oakland, where for years waterfowl have been free from molestation, the winter population is something like half what it was at one time.

The Curator Emeritus inclines to the opinion that such reduction in numbers is inevitable and results, at least in part, from the extensive reclamation of marshlands and the natural silting up of our estuaries, which, in turn, results from agricultural development.

This is a matter of interest to all upper bay communities which count among their most valuable assets the exceptional opportunities afforded for hunting and fishing. It would be little short of a calamity if, like large sections of the east coast, we must eventually sacrifice sport for progress, but it may be one of the prices of progress exacted by Mother Nature is just that.—*Vallejo, Chronicle.*

SPRIG NEST ON REFUGE

Sprig nested in quite large numbers during the past season on the Gray Lodge migratory waterfowl refuge of the Division, according to Asa McClellan, superintendent in charge of development work.

Pairs of mallard have also been noted but sprig seem to be the predominating species, the superintendent said. Conditions are ideal for them.

"Of course, I have not made any sort of a detailed survey of the bird population," McClellan said, "but when I first went into the flooded section I was surprised to find such a large variety of waterfowl. It is very deceiving from a distance and a person is liable to think the marshes deserted, but once you start penetrating the water and tule lands you suddenly find yourself in the midst of all sorts of winged life."

The refuge which is located near Pennington in the Sacramento Valley was recently acquired by the Division of Fish and Game as a



Fig. 129. Sprig nested in large numbers on the Gray Lodge migratory waterfowl refuge in Butte County. Picture shows the type of nest constructed. Photo by H. C. Bryant.

part of a program for a chain of such lands throughout the State. By maintaining such a system of protected resting grounds it is hoped to hold a large majority of the ducks in the State during the migrations from the north.

Money for the purchase of such refuge lands comes directly from the hunting license fund. The legislative act requires that one-third of all moneys collected annually from the sales of hunting licenses for a period of five years be set aside for sueh purpose. The program started January 1, 1928.

Four baby sprig ducks were hatched at Duck Island in Lake Merritt during the early part of June. The lake is located in the heart

of the city of Oakland, Alameda County. This is the third brood of wild fowl ever to be hatched at this lake. The wild birds generally migrate before hatching season.

NEW REFUGE UNDER DEVELOPMENT

Development work on the Gray Lodge migratory waterfowl refuge of the Division was well under way during July, according to J. S. Hunter, in charge of the State Bureau of Game Refuges.

This refuge was recently acquired by the State after a careful survey by the Game Refuge and Public Shooting Grounds Advisory Committee. The committee consists of the Director of the California Academy of Sciences, Director of Hooper Foundation for Medical Research of the University of California and five other members appointed by the Fish and Game Commissioners.

The area consists of 2541 acres in the lower end of Butte County, near Pennington, and has a plentiful supply of water near at hand. According to Asa McClellan, field superintendent, there is already between 800 and 1000 acres under water, and this despite the unusually dry season.

During the survey by the committee it was learned that there has been an average annual kill of more than 12,000 ducks on this property during the open season. This, Hunter said, shows that it is an excellent duck locality.

Former owners of the property invested more than $100,000 above the purchase price to the Division, records show. These acquired developments include buildings, freshwater tank, various canals, levee construction, miscellaneous machinery, fences, roads and numerous other assets. McClellan said improvements would greatly simplify and speed the developments as outlined by the Division.

First on the program of work will be the construction of roads to various sections of the property. This will not only afford better patroling facilities throughout the year, especially during the duck hunting season, but will be an essential factor in constructing additional lakes and canals.

After the roads are built then the work of repairing fences and other construction work will proceed according to plans, the superintendent said.

DESCRIBE LOCAL BIRD REFUGES

How farmers, public officials, and others can attract and protect birds by establishing refuges for them is told in a new Farmers' Bulletin entitled "Local Bird Refuges" just issued by the U. S. Department of Agriculture. "Farmers, in particular," says the bulletin, "will be interested in the establishment and maintenance of effective bird refuges, because the welfare of crops and the commercial success of the farm are intimately related to the numbers and kinds of birds present and to their economic tendencies. Bird refuges on farms have been most successful when established and maintained cooperatively by the landowner and a state game commission, an Audubon society, a bird club, or a school."

Local bird refuges may also be created in wood lots, along roadsides and right of ways, in community parks and parkings and cemeteries and on picnic, fair, school, college, and reservoir grounds and golf courses. All these types of land which are adaptable as bird sanctuaries

are discussed in the bulletin. It gives suggestions for planting trees and shrubs to make the areas more attractive for the birds. A table shows the preference of birds for the various kinds of fleshy fruits recommended for planting. It also refers to other publications of the department dealing with roadside planting, farmstead beautification, and methods of attracting birds.

Copies of the new publication, Farmers' Bulletin 1644-F, may be obtained free, as long as the supply lasts, by writing to the Office of Information, U. S. Department of Agriculture, Washington, D. C.

REDUCED WATERFOWL KILL FORESEEN BY OFFICIALS

Severe limitation of the number of waterfowl to be killed the coming season may be necessary as a result of long continued drought in nesting areas of the United States and Canada, officials of the Bureau of Biological Survey, U. S. Department of Agriculture, indicated today, after considering reports of bureau representatives recently returned from expeditions to northern areas of the United States and in company with Canadian officials to the principal duck breeding areas in Canada. Although federal regulations governing the shooting of ducks and geese were recently amended to reduce the open season throughout the United States by two weeks this fall and winter, still further restriction of the annual kill may be necessary, the officials stated.

The Biological Survey investigators brought back discouraging reports of unprecedented drought, of lakes and ponds and marshes turned into dusty barrens with no sign of aquatic life. They reported the almost complete absence of water during the breeding period in the great prairie breeding grounds of southwestern Manitoba, southern Saskatchewan as far north as Saskatoon, and Alberta westward to the foothills of the Rocky Mountains and northward to the vicinity of Edmonton. A marked shortage of breeding ducks and young was noted in the great delta region of the Peace and Athabaska rivers. In tours of several thousand miles the investigators saw only a few dozen small broods of young ducks in an area that in normal years has produced many millions of mallards, pintails, redheads, canvasbacks, bluebills, and teals.

The shallow prairie sloughs and lakes of the region have disappeared following about 10 years of reduced rainfall and three seasons of persistent drought, Biological Survey officials explained, and a far-reaching inquiry sent out by the Canadian Government has failed so far to show that the ducks have found other more remote breeding areas. Not all the ducks and geese that come into the United States are bred in the region surveyed, it was said, but a very large proportion of the wild fowl that make up the great flights know that country as their birthplace, and the shortage of breeding birds and the loss of so many young will have a serious effect upon shooting conditions both in this country and in Canada.

The Canadian and United States governments under the migratory bird treaty, it was pointed out at the Biological Survey, are both concerned over the disastrous conditions that now threaten the wild fowl of the continent. The two governments are therefore endeavoring to avert shortages by devising methods for saving an adequate supply of breeders for next season. The severity of the limitations that may be

necessary will not be determined definitely, the Biological Survey officials say, until after further conferences between the authorities of Canada and of the United States and until more information is received from the nesting grounds. It is apparent, however, they say, that the drought, which has caused so much distress and economic loss to farmers and to industry generally, will also directly affect the sportsman. To avert the grave possibilities of a permanent disaster to the wild fowl, the gunners in all sections of both countries will probably be asked to reduce their duck shooting this winter to a minimum, so that enough mature birds will survive to breed and thus enable the flocks to replenish themselves with the return of water to the parched areas.

HERDING GEESE BY PLANE

The tenderfoot who was sent out to round up the lambs on a western sheep ranch, and at nightfall closed the corral on 50 panting jackrabbits, met his match recently in two native Oklahomans who set out in an airplane to ride herd on a flock of wild geese.

They succeeded, but too well. Circling about the river banks they forced together an enormous flock, and drove the birds southward along the river. Here "hunters" were waiting in blinds, and fired almost point-blank into the mass of birds.

The fun was taken out of this new form of slaughter, however, when the "herd riders" in the airplane learned that game wardens had witnessed the incident. Oklahoma, like many other states with progressive fish and game commissions, prohibits the hunting of birds from airplanes, and the two airplane pilots paid fines of $131 each.

GEESE AND SWANS

Flocks of wild geese, estimated to contain nearly a million birds, are resting on prairie lakes in Western Canada on their way to their nesting grounds in the far north, according to the fish and game department of the Canadian National Railways. Old-timers state that the birds are more plentiful than at any time within their memory. An interesting and encouraging feature of the northern migration of wild birds is the presence this year of flocks of wild swans which, a few years ago, were considered almost extinct.

MAMMALS

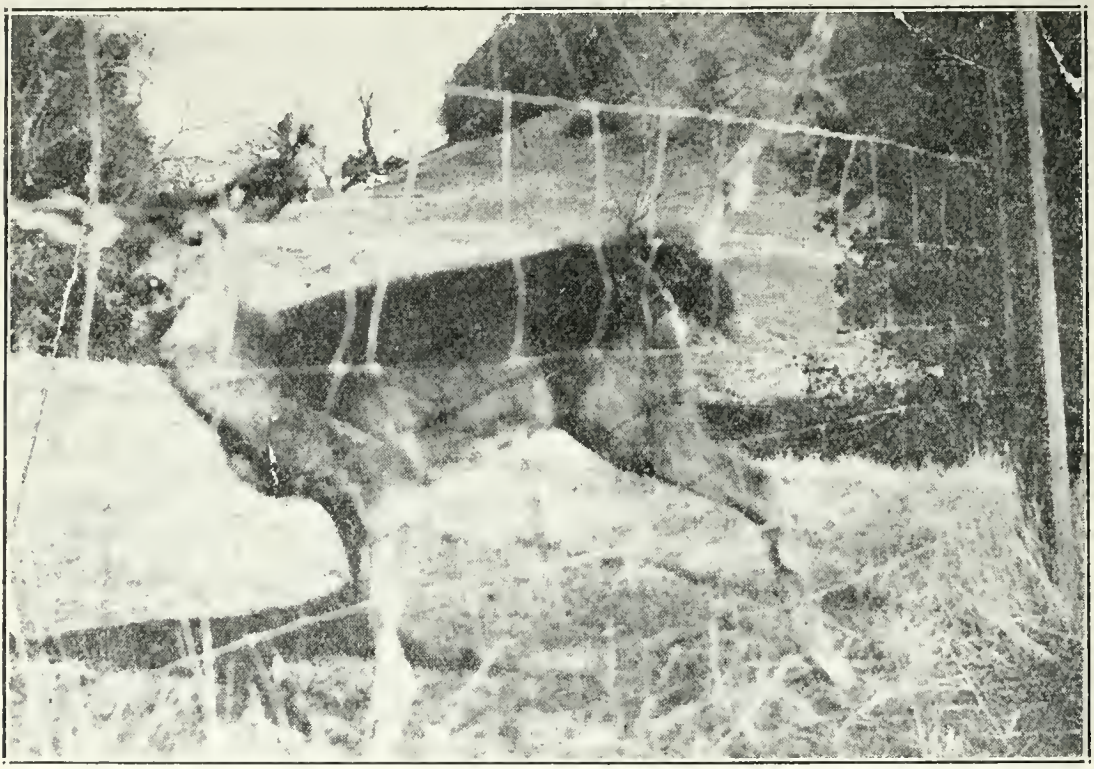


Fig. 130. Deer often become entangled in fences and other obstructions. This doe was discovered by game wardens and released before fatal results occurred. Note the angle at which the hind leg is impaled. Photo submitted in July, 1931.

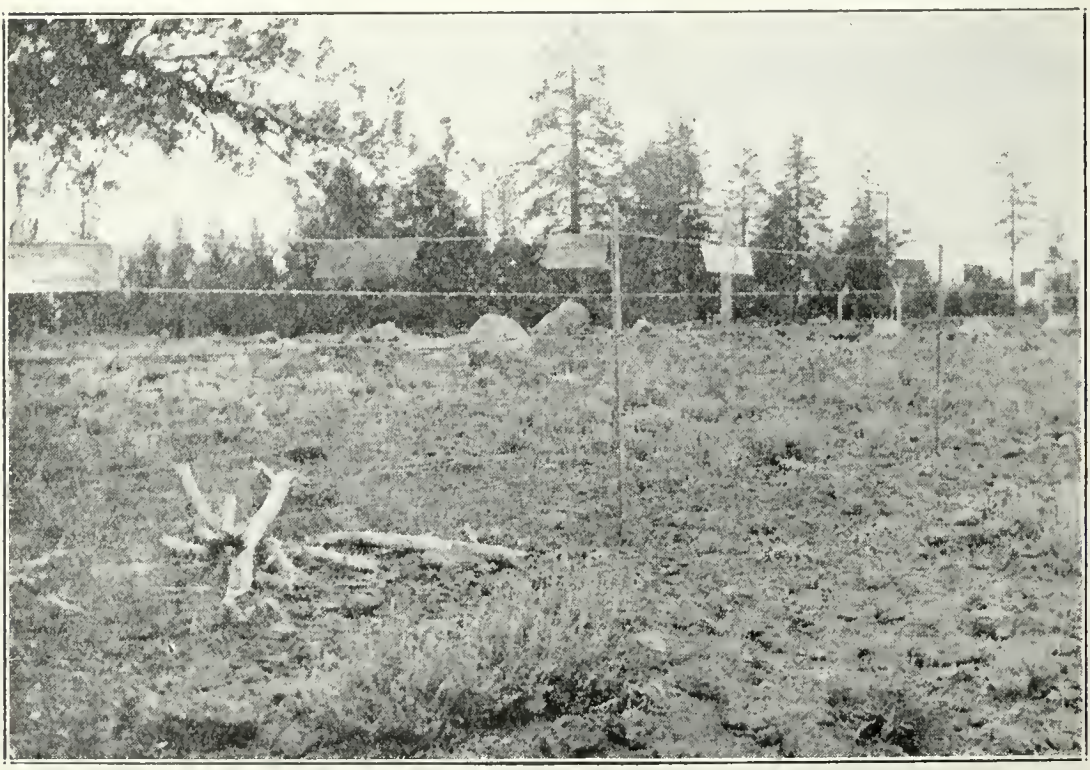


Fig. 131. Making the woods safe for the wild animals in Modoc County. This photo, taken along the Southern Pacific Company right of way near Boles, shows strips of tin hung loose along top wire of fence as a warning to the wild animals. No deer have been reported killed through collision with the fence in this district since the markers were installed. Photo submitted in June, 1931.

ELIMINATE FENCES TO SAVE DEER

Mule deer in the Modoc National Forest are to be protected from a railroad line by the elimination of right of way fences, according to reports from Westwood. The line is the Great Northern Company which runs through the country from Klamath Falls to Bieber. Not that the deer can not hurdle the fences with ease, but it has been discovered that the mammals become frightened or confused, crash into the fences and break their necks. Holders of cattle grazing permits presumably will be required to sign releases of all such claims, according to the report. Close observations are to be made on the problem and if stock losses are more expensive than fences the fences will eventually go up.

KILLS DEER WITH KNIFE

An interesting story appeared in the *Fresno Republican,* recently, which told about a man killing a buck with a knife. The narrative reads as follows:

A color-blind Los Angeles man killed a deer with a butcher knife at Pine Springs in Lockwood Valley.

Take a deep breath and hang on. Here comes the story, verified by Bakersfield hunters who were on the ground. The southern sportsman didn't even see the deer at first.

His wife spotted it lying in the brush and called her husband.

"There's a wounded buck lying over there," she said excitedly.

He came running up with a butcher knife and she pointed it out to him at close range.

"Might as well cut its throat and put it out of its misery," he said. "The hunter who shot it probably will be along in a minute."

But no hunter came along, because after the buck gave its final kicks, the hunting party camped at the springs looked it over and there wasn't a bullet wound on its body. It evidently had been dazed to the point of exhaustion by hunters.

MORE DEER, MORE TOURISTS, CLAIM HUNTING CRITICS

Two herds, threatening each other in a strange fashion, form the latest nightmare of trouble brought upon officials by the too prolific mule deer of the Kaibab National Forest, a high plateau on the north rim of the Great Canyon in Arizona.

The other herd in the extraordinary tangle, says a bulletin of the American Game Association, is the tourist herd—which has also increased at a great rate on the north rim of the canyon, largely because of the added attraction supplied by the Kaibab's deer.

The tourists, but especially Arizona citizens interested in this human herd, have raised a howl against efforts of government agencies to reduce the deer herd.

A growing faction is claiming that if the number of deer is decreased the north rim tourist trade will die out. The officials representing the United States Forest Service, the Biological Survey and the Arizona Game and Fish Commission, have contended that unless the deer herd of about 20,000 is cut down more strenuously and successfully than in the past it will soon completely destroy its food supply, already badly depleted, and disappear of starvation and disease.

To settle the controversy the officials called upon all the national conservation organizations. Leaders from the American Bison Society, the American Forestry Association, the American Game Association, the American National Livestock Association, the Izaak Walton League, the Camp Fire Club of America and the National Association of Audubon Societies were in the Kaibab late in June, studying the situation as an unofficial advisory committee.

Official investigators have reported that in spite of open hunting seasons and trapping and shipping, the only appreciable reduction of the herd has been from starvation and reduced numbers of young due to loss of vitality.

FAWNS APPEAR EARLY

Fawns appeared quite early this past year according to reports coming from various sections of the State. Here is an interesting note that came from observers in the Giant Forest, Sequoia National Park:

As has been the case for several years, the first fawn of the season was seen on June 14. Several have been seen since that date and more will be coming all the time. The little spotted fellows will soon be seen wobbling along after their mothers or curled up in a protected spot where their mothers left them.

Warnings are issued every year through the press and at camp fires that people seeing these fawns should never touch them. They are so cute that it is a great temptation to pet them but such an act may cost a fawn its life.

Fawns have no body odor for the first month of their lives. This is nature's way of protecting the young deer. They are so near the color of their surroundings that it is hard to see them, so the mother may leave them and go away for hours and the fawns will not move unless disturbed. Predatory animals may pass close by a sleeping fawn and not see it. The touch of a human's hand upon the little animal will leave the human scent, which will be noticeable to the wandering lions, bear, coyote or other enemy and the fawn would have no defense from an awful fate.

If a fawn is with its mother, it is sometimes possible to get close enough to take a picture of it, but if it is alone, do not try to get close to it. If a fawn is frightened away from its bed, it sometimes starts running and the mother has great difficulty in finding it again. It is pitiful to hear a lost fawn crying for its mother and the doe will be running around calling for her baby at the place where she left it.

The doe takes care of her fawn, or twins, until time for the new babies to come, when she quietly slips away from the yearling. It will go about looking for its mother for two or three days, crying like a kitten. Sometimes the doe will allow her yearling to go with her again after her new ones are a few days old, but not always. Deer have individual taste and habits, as people do. Some deer will be fond of one food which another will scorn. Some become very gentle, while others always retain a certain amount of timidity and will never learn to eat from a person's hand. Their characteristics are a never-ending source of amusement to those who are well acquainted with them.

SAVE THE FAWN

Fawns do not get lost! Whenever you find one of these little big-game animals wandering in the woods or near the highway you can rest assured that Mrs. Doe is near at hand and is well informed as to the location of her child. She may keep herself concealed, but she is there nevertheless.

Unfortunately Mrs. Doe does not always seem to be able to control the wanderings of her young. "Peck's Bad Boy" often follows silly notions and does so without punishment—that is unless some uniformed member of the human species finds him "lost" and seeks to "save" him.

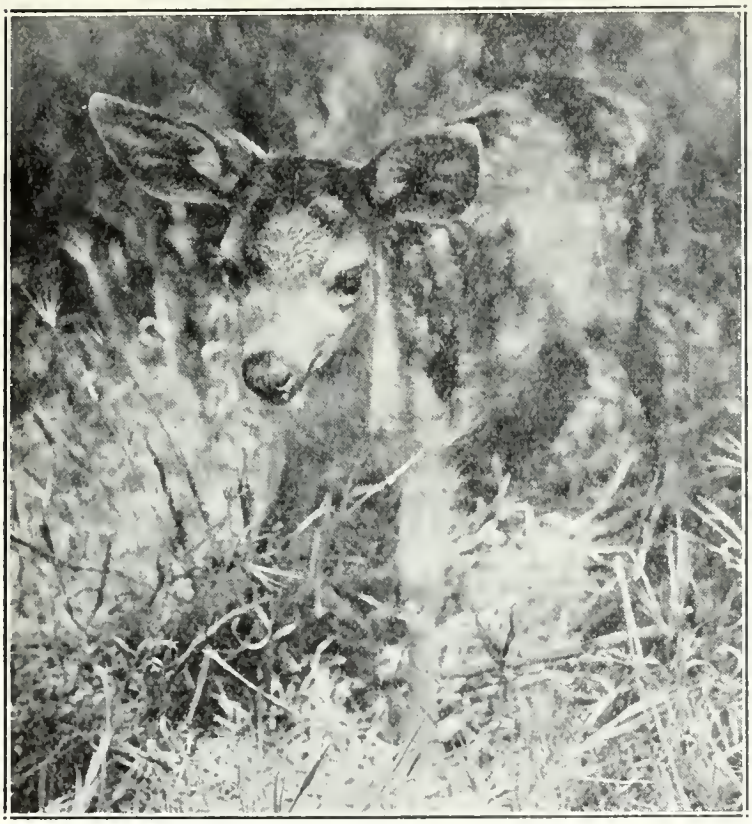


Fig. 132. Fawns do not get lost! No matter where you find them you can rest assured that Mrs. Doe is near at hand and does not approve of your attempts to "save her child." Note the spotted coloration for protective purposes. Photo by E. S. Cheney, June, 1931.

E. L. Macaulay, chief of the bureau of patrol, has issued an appeal requesting all persons to guard against the "fawn fever." It is an humane appeal.

"Drive carefully in the deer country so as not to destroy the wild animals," Macaulay said, "and when you find a fawn, or any other wild animal for that matter, do not try to take them for pets. In case you positively know that the mother of a fawn has been killed or fatally injured be sure to note the location and report to the nearest State game warden. It is not very difficult to get information at habitations."

In addition to the harm caused by picking up these little fawns, a heavy penalty may be imposed upon those violating this section of the fish and game laws. A fine of not less than $50 or more than $500, or imprisonment for not less than 50 days or more than 150 days or by both such fine and imprisonment is provided for. Also, the official states, a permit from the State is absolutely necessary to keep these animals and due to the difficulties involved in providing for their welfare, it is extremely difficult to procure such legal sanction.

FEW CARIBOU IN UNITED STATES

The last herd of caribou known in the United States, consisting of an estimated 400 animals but very possibly considerably fewer, now roams Isle Royal in Lake Superior, and it is possible this last group

may cross over the ice some winter and disappear into Canada, according to an oral statement recently made by Vernon Bailey, senior biologist of the Biological Survey, Department of Agriculture.

Caribou until recent years were found in small numbers in Maine, the "panhandle" of Idaho, Isle Royal, and the region of Minnesota opposite Isle Royal. Hunting has pushed them northward until most recent reports show that there probably are not more than two or three, if any, carbiou in the Idaho region, the last herd of 25 known in Minnesota has disappeared, and none are known in Maine.



Fig. 133. Deer occasionally misjudge their footing. This animal lost its life through accident on the R. R. Rush ranch in Lake County. Photo submitted by R. A. Russ, July, 1931.

TRAGEDY

Deer are not always as sure footed as one would imagine. Accidents often happen to these big game animals and many times the results prove fatal.

The accompanying photograph best explains what happened to the deer found on the R. R. Russ ranch in Lake County on April 10. As

the picture shows, the animal had been dead for a considerable number of days before being found.

As a means for explanation it is believed that the deer was standing on its hind legs in an endeavor to browse on the leaves, moss or mistletoe on the lower limbs of the tree. In some unknown manner the animal's front foot must have slipped into the narrow crotch of the tree and became tightly impaled during the proceeding struggles.—R. A. Russ, Lake County, July, 1931.

BEARS FEED ALL AFTERNOON

Dinner time for the bears at Giant Forest's famous Bear Hill is being changed from the regular 3 o'clock lunch hour to an all afternoon banquet, beginning soon after noon each day.

It has been observed for the past several weeks that many of the bears come in with gaunt and hungry looks, several hours before 3 p.m., and restlessly investigate the remains of the preceding day's meals. They then roam around or sleep till feeding time. Little or no action or performance occurs until the meal is on the table.

Beginning July 4th, the garbage trucks will start placing the bears' dinner at the Bear Hill platform soon after noon, and at frequent intervals thereafter all afternoon. The bears may readily be seen and enjoyed at any time during the afternoon and evening. The best shows, with the largest numbers of actors and the most "teddy" bears, usually occur late in the afternoon.

Park visitors will much benefit by this change in feeding time. Hundreds, even thousands on week-ends, come to see the bear show, and the congestion of cars and people has detracted from the performance of the bears. By spreading out the time of feeding, more people can see the bear show and without the difficulty of getting a good seat and parking area.—*Sequoia National Park Service.*

BRUIN SHOCKED

Bears caught robbing the traps at the Yellowstone Fish Hatchery recently were "given the works," but not to a fatal degree.

It happened this way, according to Park Naturalist Alfred H. Povah. The traps, placed at the most advantageous spots in a number of creeks, were supposed to catch quantities of fish ready to spawn, and thus supply plenty of eggs for restocking purposes. Plenty of fish were seen in the creeks on their way to these spawning grounds, but the traps remained empty. The fish culturists, acting as piscatorial detectives, solved the mystery. Through a few scattered eggs lying along the bottom of the creek just below the trap, they deduced the fact that bears were robbing the traps, and decided to administer an unforgettable lesson.

These traps were inclosed in a fence of wire screening about three feet high. Inside this and about one inch away from it, the hatchery men strung a single strand of heavy copper wire. This was connected with two large storage batteries, hidden in a nearby box, in such a way that when the wire screening was pushed against the copper wire an electric contact was made. The fact that the bear depredator had to stand in water to reach the trap assured a "ground" for the electric current through the animal. This current, while not strong enough to injure the bears, gave them a positive deterrent against fish forays

Within a week after the shocking apparatus was installed the trap was full of fish—and there will be plenty of eggs for restocking the lakes and streams.—*Science News Letter*. July 4, 1931.

COYOTE DINES ON BOBCAT

Somewhere in the wilder reaches of Ventura County there must have been a meeting between a coyote and a bobcat. From all available evidence the coyote emerged victorious.



Fig. 134. Don Coyote is not very particular in regard to his diet. He will eat anything from bobcat to old shoes, and will thrive where others fail. This fellow appears to be very well fed. Photo submitted by C. O. Fisher, January, 1918.

And the evidence at hand has come to the office of the Division in the nature of stomach contents of the alleged victor. In making a study of the food habits of the coyote, game wardens are sending the stomachs of all victims to the office for examination.

Here are some of the facts that Donald D. McLean, field naturalist, learned about the fellow in question: The stomach was about one-quarter full and contained three claws, one toe, three toe pads and a quantity of hair, all from a bobcat. There was also a small quantity of grass and one feather shaft.

Whether the coyote inherited this banquet through the process of battle victory is, of course, a matter for speculation. Those who are acquainted with the defensive abilities of the wary bobcat are inclined to scout the battle theory, and declare that the cat must have been killed by some other agency.

However, it is anybody's guess and the fellow with an imagination for romance can feel secure in standing by the victor-spoils conclusion.

TELLS HOW TO TRAP BOBCATS

When bobcats become a menace to live stock, it is easy to catch them in common double-spring steel traps, sizes 2 and 3, says Stanley P. Young, of the Bureau of Biological Survey, in Leaflet 78-L, Hints on Bobcat Trapping, recently published by the U. S. Department of Agriculture. "Such traps," explains Mr. Young, "have been used by many generations of trappers, and although deemed inhumane by some persons, no better or more practical device has yet been invented to take their place."

Since human enroachment on the bobcat's natural haunts, where it is accustomed to prey on rabbits, other injurious rodents, and such valuable forms of wild life as antelope, deer, wild turkey, and quail, this predator has found the young of the domestic flocks and herds very satisfactory substitutes, says the leaflet. Where this new provender is more easily obtained than is food in the wild, the bobcat becomes a serious menace, the leaflet points out, as in Arkansas, where locally it has become a threat to the hog-raising industry. Urged on also by a lust for killing, the animal's depredations sometimes become exceedingly heavy; in one case, cited in the leaflet, a single bobcat killed 38 lambs in one night.

Field experiences of federal and cooperative trappers applying methods developed by the Bureau of Biological Survey, on which Mr.

Young bases his hints, have demonstrated that the bobcat can be caught in traps placed in holes dug directly in the trail of the animal and concealed with dirt. Fetid and natural scents and such lures as catnip oil, it is also explained, may be used to attract the animals to traps set on either side of the trail, near stubble, a bunch of weeds, an exposed root, or any object known as a scent post.

"Hints on Bobcat Trapping" furnishes further directions for making the various sets, preparing scents, and caring for traps. It also calls attention to the importance of such details as avoiding human scent near the sets, deodorizing traps, and caring for traps in frozen ground. This publication, Leaflet 78-L, may be obtained free on request to the Office of Information, U. S. Department of Agriculture, Washington, D. C.

BIG GAME ANIMALS PASS MILLION MARK IN THE NATIONAL FORESTS

"Big game animals in the National Forests now number more than a million head. A gain of approximately 9 per cent in 12 months is shown by the annual wild game 'census' of the Forest Service, U. S. Department of Agriculture, just announced, by the Department.

"The total big game population of 1,073,111 is an approximation of the number in the 151 National Forests as of the first of this year, the figures being based partly on actual count and partly on estimates by experienced local forest officers. Game animals on public and privately owned range outside the National Forests were not included in the estimates. The National Forests, however, include the greatest total area of big game range now remaining in Government ownership.

"This year's increase is chiefly in deer, but elk also have gained considerably. Moose, mountain sheep, mountain goats, and antelope, none of which are very numerous, show slight gains. Bears are keeping up the struggle for existence in fair numbers, although the great grizzly gave ground in many of the National Forests and black and brown bears suffered in some localities.

"Big game hunters, naturalists and the nature-loving public may thank better protection, systematic control of predatory animals, and better range conditions for the preservation and improved status of game, according to the Forest Service. Most of the increases have occurred on areas where only the remnants of larger herds were left a few years ago. The satisfactory results to date point to the necessity of careful estimates of range capacity and the development and application of management plans to prevent overstocking of certain areas, to provide restocking on others, and to secure an increase on still other areas, says the Forest Service. Increases in wild life thus far obtained have not resulted in a material curtailment of domestic live stock on National Forest ranges; through improved management the range is made more productive for both classes of animals.

"Moose in the National Forests were reported to number 7760, a gain of more than 2600, in part resulting from the inclusion in 1930 of the National Forests in Minnesota, where no count was made in 1929. There were gains for moose in Alaska, Montana, Wyoming, and Idaho. In Oregon National Forests, moose last year went the way of the grizzly in California. Not one was found. Four head of moose are

credited to the White Mountain National Forest in New Hampshire, where none were listed the year before.

"Hunters bagged 4352 elk in the National Forests last year, but there are 88,200 still running, as against 82,670 in 1929. Wyoming, Montana, Arizona and Utah account for most of the increase.

"One of the American game animals once supposed to have practically disappeared is the antelope. The National Forests this year, however, showed a 45 per cent gain in antelope as compared with 1927, the latest 'census' listing their number as 11,140, as against 7660 in 1927 and 10,220 in 1929. Arizona, California, South Dakota and Idaho lead. An attempt to establish a small herd of antelope on the Wichita National Forest in Oklahoma proved unsuccessful.

"Slight increases in bear population of National Forests in Alaska practically offset the losses in some of the States. There are estimated to be 2800 Alaska grizzlies and brown bears, and 5750 Alaska black bears. In several Rocky Mountain States few grizzlies remain—only one was recorded in Utah. The total National Forest grizzly population, exclusive of Alaska, is placed at 870. Deerlodge National Forest in Montana has 206.

"Black and brown bear are still found over wide areas from coast to coast. More than 50,000 of them live in the National Forests. Virginia, California, and Utah Forests show decreases in bears. Small gains are reported from North Carolina, New Hampshire, West Virginia, New Mexico, Arizona, and Alaska National Forests.

"First place for black and brown bears, Alaska excepted, goes to the Olympic National Forest in Washington, with 2080. Mount Baker National Forest, in Washington, is runner-up. Three or four other forests in the Northwest and in California, and the Superior in Minnesota have 1000 to 1500 each. About 800 bears are recorded for the White Mountain National Forest in New Hampshire, 350 for the Shenandoah in Virginia, and 100 to 300 each for several other forests in the East.

"Mountain sheep and mountain goats still range about the high peaks of Alaska and the northern Rocky Mountain States. This year's estimate placed the totals at 21,860 and 12,500, respectively. National Forests in Washington show an increase of 500 mountain goats, and a few mountain sheep have appeared there.

Colorado National Forests lead in mountain sheep, with 3500 reported. About one-tenth of all the mountain sheep and 10,000 mountain goats range in the National Forests of Alaska.

"The latest estimates showed deer on every one of the 151 National Forests. Under State and Federal protection and under hunting regulation in the National Forests, deer increased last year from 802,450 to 877,780.

"Despite the many thousands of deer bagged by the hunters, most of the National Forests in the West showed gains. California now has 259,300 deer in its nineteen National Forests; Arizona more than 91,000 with a gain of 6000; Colorado 36,380, with a gain of 3000. In the National Forests of the South deer showed increases; in most of those of the Middle Appalachians slight decreases. The Alabama National Forest, with 500 deer, showed a gain of 100 per cent. The Allegheny National Forest in Pennsylvania, with 5000 head, has 2000 more deer than the year preceding."—*DuPont Game Conservation News,* July 15, 1931.

LION HUNTING DANGEROUS SPORT

With more than a hundred wounds as proof, Gene Holder, a Biological Survey hunter in the Coconino National Forest of Arizona, is positive that it is not safe to stand directly under a mountain lion when intending to shoot one. Holder's dogs had treed the lion and, thinking to prevent it from falling over a cliff, he placed himself between the treed lion and the canyon. As he took aim his foot slipped in the snow and a wounded instead of a dead lion landed almost on him. After a desperate fight he killed it with his hunting knife, and then rode three days to Flagstaff to be treated by a physician.—*U. S. Forest Service Bulletin.*

CATS ARE FACTORS IN SPREAD OF RABIES

The State Board of Health, at its regular meeting held in San Francisco, April 11, 1931, directed that the attention of all health officers in California be called to the increased prevalence of rabies in animals and to the necessity for intensive action in the control of the disease.

The board directed, also, that the attention of all health officers be called to the necessity for the application of control measures to cats as well as dogs. It has been determined, recently, that stray, homeless cats are decided factors in the spread of the disease in this State.

POOR LITTLE SKUNK CRAVES HUMAN LOVE

Misunderstood! That is all that has been wrong with the poor little skunk, whose very name has grown to have odoriferous implications.

Experts now say the skunk is a charming companion and longs for nothing more intensely than to be with human beings, says a bulletin of the American Game Association. This accounts for its presence often noted, yet seldom appreciated, near farmhouses and even in villages.

The skunk is still listed as an undesirable in some states because of his alleged egg-eating and nest-destroying propensities.

MISCELLANEOUS

PROTECT HOMING PIGEON

A letter was received by the Division from W. E. Mabey, 1824 University Avenue, Berkeley, which states that homing racing pigeons are being shot and mutilated during training and racing, by hunters. The note said that "during the 1930 young bird series there were several birds that came home, flying distances ranging up to 500 miles, with their wings and breasts pierced with shot. Notwithstanding the fact that some of the birds cost about $100, some action should be taken to end such cruel practices."

Many pigeon clubs begin the season's activities in May and deputies are urged to discourage the hunting of birds and to report violations to proper authorities.

BIRDS THE FLIERS

The ducks that wing their way northward through the March dawn, the hawks that hang and watch for a change to pick one of them off, even the robins and blackbirds that flit across the lawns, are still more efficient flying machines than the best of man's inventions. They have better designs, and they get more mileage out of a calorie of energy than any airplane now in existence or likely to be built.

This is brought out in a number of points in a study of bird flight which has been made by Dr. Lucine H. Warner, of White Plains. His findings will be published in detail in the forthcoming issue of *The Quarterly Review of Biology.*

Birds have so reduced the weight of other body-parts that they can devote from one-sixth to one-half their total weight to the flying muscles, notably the big ones that form the breast of the bird and pull the wings on the down-stroke. In the pigeon these muscles weigh as much as all other parts of the bird taken together.

The streamlining of birds' bodies has long been noticed. It shares this low-resistance shape with fishes and other swimming animals, but has the advantage of smoothing out hollows and irregularities with almost weightless feathers instead of heavy flesh. Many flying birds tuck up their feet, being prototypes of planes with retractile landing gear, and those that are too long-legged for this, trail their legs so as to make the least possible resistance in flight.

Highly efficient also is the utilization of food by birds, and its combustion in the tissues to produce energy. Analysis of food remains after digestion shows that birds assimilate much more of what they eat than do mammals. Their blood carries a higher number of red corpuscles per cubic millimeter, and therefore transports more oxygen to the final burning-places of dissolved foods, which makes for more efficient energy production.

Birds have a system of breathing peculiarly adapted to the needs of flying animals. The active part of respiration is exhalation, or breathing out. This is accomplished by compression of the ribs and breastbone, which surround the lungs. Thus the more rapidly the wings are moved, the greater the amount of air forced in and out of the lungs. A bird is thus less likely to get out of breath than is a mammal, which has a breathing apparatus quite independent of its movement muscles.

Dr. Warner also discusses the different methods of flight used by birds, and offers a new theory regarding the soaring flight of such birds as hawks and buzzards. It is his belief that such birds take advantage principally of the gustiness of the wind, adjusting themselves instantly to changes in its direction or force in such a way as to exploit its energy to gain additional lift.—*Science—Supplement,* Vol. 73, No. 1889, March 13, 1931.

CARBON MONOXIDE KILLS BIRDS

Here is a story, circulated by the *Associated Press,* that tells about the effect of automobile exhaust gasses on bird life, and the material herein may be of interest to ornithologists:

A never-ending gas attack from the exhausts of automobiles is taking heavy toll among English sparrows and pigeons, says Austin H. Clark, biologist of the United States National Museum.

These two birds, which formerly were common in the cities of Eastern United States, have been disappearing rapidly.

They feed largely on street refuse, which brings them into contact with carbon monoxide gas from motor exhausts. It is a heavy gas that tends to cling to the ground when there is no wind.

It takes very little carbon monoxide to kill a bird or weaken it so it is easily caught by cats, hawks or other enemies, Clark explains.

This is because birds live "at high speed." Their bodies transform oxygen into heat much more rapidly than human bodies.

They must have plenty of oxygen at all times. Anything such as gas that tends to block the oxygen supply from their lungs has a bad effect almost at once.

English sparrows were imported from Europe before the days of modern sprays and insecticides, to eat the canker worms that were infesting American elm trees.

They accomplished their purpose but aroused complaints among bird lovers because they drove away other birds from birdhouses and feeding places.

DATA ON BIRD PEST DRIVES

Approximately 150 of the many hawks and owls killed in the Cole County Anti-Hawk Club's (Missouri) last campaign came into the hands of Ernst Schwarz, state taxidermist for the Missouri Game and Fish Department, who examined the stomach contents of each bird. A summary of the species examined is as follows:

Red Tailed Hawk—fifty per cent of the total number of hawks examined were of this species, considered by the U. S. Department of Agriculture as highly beneficial to agriculture. Every stomach contained mice and other rodents. Only two stomachs showed even a trace of feathers. If the hawk was to feed on game he would have done it at the time the campaign was on as the winter was severe enough to cause a natural food shortage.

Barn Owls—the stomachs of the two specimens of this beneficial owl contained only rodents.

Barred Owls—several stomachs examined showed moles and rodents.

Broadwing Hawks—the eight stomachs examined showed only snakes and rodents.

Marsh Hawks—the five specimens showed only rodents, lizards and snakes.

Osprey—this "fishhawk" contained only fish.

Red Shouldered Hawk—the one specimen contained only rodents.

Screech Owls—the four stomachs showed only mice.

Short Eared Owl—the two specimens showed only mice.

Sparrow Hawks—the six stomachs showed only small shrews.

Cooper Hawks and Sharp Shinned Hawks—fewer than a total of fifteen of these hawks, less than 10 per cent of the total number killed, were taken. These stomachs showed feathers of several species of birds.

Great Horned Owl—the fifteen specimens taken revealed birds largely. A rabbit was found in one stomach.

Hawks and owls known by ornithologists to be found in this region but not taken in the last eampaign included the snowy owl, American rough legged hawk, black vulture, turkey vulture, goshawk, golden eagle, long eared owl, saw whet owl, duck hawk and pigeon hawk.

It is pointed out that farmers are permitted to control any bird which causes them loss of their property and should landowners have an actual grievance they can take their own steps toward control of such creatures. It is possible that individual hawks of a nonharmful group may kill poultry and other birds but this practice is not the usual habit for most species.

NOTE—As a rule here in California we do not have the barred owls, broadwing hawks or the black vulture, and our species of red bellied hawk is a descendant of the red shouldered hawk. The snowy owl is also exceedingly rare in our State. We are also examining the stomachs of all species as they are secured by the Division.

BIRDS PREY ON RODENTS

Promotion of deadly air raids by nature's "fighting planes" is being urged by agricultural colleges as an urgent necessity in combating a threatened large increase in the number of field rats, mice and other rodents and the possible destruction of hundreds of thousands of dollars worth of crops.

Due to the drought and the mild winter an unusual number of rodents can be expected in most sections of the country, according to a bulletin of the American Game Association.

Rudolph Bennitt of the Department of Zoology of the University of Missouri has advised the Missouri Department of Fish and Game to encourage protection of beneficial hawks and owls, among the most effective enemies of rodents.

Though there are more than 30 species of hawks and owls in the state, Bennitt said, and only four that prey on poultry, game and other birds, many farmers kill them indiscriminately and indirectly cause heavy loss of crops, insect-eating birds and game from destructive small animals.

Sportsmen and farmers, before shooting hawks and owls, should apply to their state game departments for detailed information on which species are harmful and their description, the association report advised. This was declared important, since certain species considered undesirable in one section have been declared valuable in another.

The only hawks generally recognized by game officials as enemies of bird life are the Cooper's or "blue hawk," the sharp shinned hawk, the goshawk and the scarce duck hawk and prairie falcon, the report stated. The outlawed owl is the great horned owl.

GORDON ADDRESSES LEAGUE CONVENTION

Here is an exeerpt from an address delivered by Seth Gordon, president of the American Game Association, to the Annual Convention of the Izaak Walton League which was held in Chicago during the latter part of April. A letter accompanying the material said, in part,

"we did our best to give the highlights of the outstanding developments during the year as they were known to us."

The address, entitled "Developments in Game Conservation" is as follows: "It is utterly impossible to present the important game conservation developments of the past year in a short address, but others on the program will cover in detail some of the items which for the sake of brevity must merely be mentioned in this paper.

"The term 'game' as herein used covers all birds, mammals and fishes which are usually pursued for sport or recreation. I am glad to say this broad definition is coming into general usage, and more of the states will no doubt shorten the names of their administrative departments in charge of game and other conservation affairs. And what a lot of time we will all save when those titles get boiled down to two words—either 'Game Department' or 'Conservation Department.'

STATE DEVELOPMENT IN BRIEF

"A study of the important developments in the states during the year is very interesting. The trend is most encouraging, but there is still entirely too much turnover in administrative personnel and shifting in policy. Personnel turnovers produce chaotic conditions because the tendency is not to build upon the foundation laid by a predecessor but to tear down and build anew. And that invariably is disastrous.

"The states which have made the most outstanding progress are those which have followed a constructive program consistently over a long term of years, regardless of changes in personnel.

"One of the most encouraging trends among the states is the tendency to vest departments in charge of game with broad regulatory powers to fix seasons and bag limits; to set aside refuges and public hunting and fishing grounds; to put field forces on a merit system; and to pay greater attention to scientific research. Last but not least by any means, the sportsmen are beginning to realize that they must contribute more money with which to do the many things they expect of their state departments."

The address then reviews in brief a few of the important developments in the various states, and for California, Gordon said: "The setting aside of 750 quail refuges aggregating about 500,000 acres was a big stroke. In many cases lands heretofore closed to hunting are now open, because the lands which the owners really wanted to protect are now included within the refuges. Refuges on water reservoir lands which were previously closed to all shooting also have portions of those vast areas available to the sportsmen."

Under the heading "Big National Developments" Gordan said: "The American Game Policy adopted by the Seventeenth Game Conference in New York last December was the most progressive step in game conservation during this century. The manner in which the policy has been accepted generally is most encouraging. The longer one studies this policy the more comprehensive it becomes. Since the League had a representative on the committee which drafted that document, I hope this convention will formally endorse it so that the chapters and divisions will give the policy the support it deserves."

Commenting on research and surveys, he said: "Research and survey activities are gaining momentum rapidly. The report by Aldo Leopold covering his work of the past two years in the eight north

central states is the first thing of its kind in America. The game research work is going forward rapidly, and we will soon be able to develop our programs based upon actual knowledge instead of taking pot shots in the dark. The manner in which educational institutions are responding to the need for scientific workers is very encouraging."

Gordon then spoke of Coleman's experiment, saying: "The outstanding success of W. B. Coleman and his principal supporter, Mr. E. G. Baetjer of Baltimore, in the rearing of quail by electrically operated incubators and brooders is one of the marvels of the age. To see his birds and his equipment as I did is bound to give anyone a thrill. He has contributed enormously to the solution of our game problems, and I predict that he will solve the grouse rearing problem, if anyone will. The first of the season's grouse was laid last Saturday by a bird reared with the electric incubator-brooder method."

On problems confronting sportsmen, he said: "It is evident that at last the sportsmen are willing to give game conservation and production some serious thought. They want public hunting, and they want it as near 'free' as possible. Recent legislative attempts in New Jersey and North Carolina clearly indicate that the American sportsmen will not stand for the sale of wild game, but they will agree to compensate landowners who actually produce a game crop for the privilege of hunting it.

"The North Carolina law is a step in the right direction but large public areas must not be overlooked. Ultimately our hunting in America will fall into four classes:

1. Vast areas purchased by the public for use as refuges surrounded by public hunting and fishing grounds.

2. Still larger areas set aside for the exclusive use of those who are willing to pay the cost of an intensive game program, with special inducements to rear game.

3. Considerable areas in thickly populated sections operated under State supervision as daily-fee hunt clubs open to the general public.

4. The remainder, always the large bulk of our lands, a sort of 'no man's land' where no concerted effort will be made to produce game and where the crop will invariably be sparse."

The next part of his address had to do with funds which he says are the biggest need, and he continues: "The first of these plans requires ample funds. The present $12,000,000 a year spent for game and fish is only one-half cent per acre—and we spend $650,000,000, according to the Senate Committee, to harvest the crop. Until we spend at least $50,000,000 to $60,000,000 per year to maintain the crop we cannot hope to make much progress. Absolutely free shooting soon means no shooting. We must provide funds by one method or another, or else have no shooting worthy the name.

"Our federal agencies must have far greater appropriations for wild-life conservation. We must quadruple our staff of federal game protectors and stop this commercial slaughter and bootlegging of ducks; we must push our refuge system far more rapidly; we must find a way to go over and help Canada to save the breeding grounds of the ducks on the Continent. And until our present restrictions on legitimate shooting can be enforced adequately, it is foolish to suggest others. Let us as sportsmen stand shoulder to shoulder on these

propositions; let us each get our states to do their full share, and the funds with which to do the work will be forthcoming. But it takes work, and plenty of it.

"In conclusion, I would say there have been so many new developments in game conservation during the year that America's sportsmen are in about the same frame of mind as the chap who goes bear hunting for the first time. Every new proposal is like every crackling twig, every rustling leaf, presaging the approach of another bear. And finally the woods seem to be full of bears. By the time the real bruin comes lumbering within range chances are that the old trusty rifle will be forgotten and the bear will get away.

"This is no time for 'bear fever.' We need cool-headedness. I am convinced that thinking conservation leaders and sportsmen are not becoming panicky, and that out of the present maze of ideas will come the most progressive game program America has ever seen."

HOW HUNTING AIDED CELLINI

"Hunting as a sport is as old as the ages.

"Four hundred years ago Benvenuto Cellini, the Italian artist, wrote: 'It is true that the great delight I took in this exercise (hunting) bid fair to withdraw me from my art and studies; yet in another way it gave me more than it deprived me of, seeing that each time I went shooting I returned with greatly better health, because the open air was a benefit to my constitution. My natural temperament was melancholy, and while I was taking these amusements, my heart leapt up with joy, and I found that I could work better and with far greater mastery than when I spent my whole time in study and manual labor. In this way my gun, at the end of the game, stood me more profit than loss.' "—*Detroit News*, Detroit, Michigan.

VOLUNTEER DEPUTY REVIEWS CONVENTION

As the two previous conventions of the volunteer deputies had been held in San Francisco, it was deemed logical to hold the third in the southern part of the State to enable many deputies, heretofore unable to attend the northern meetings, to have the privilege of hearing the heads of the various departments and to receive advice on the enforcement of the State fish and game laws.

Conventions, such as these, go a long way in the overcoming of incorrect procedure, wrong interpretation of the intent of the game laws, lack of understanding by the deputy, the sportsman conservationist of the excellent accomplishments to date, and many other conservation problems.

Owing to the unfortunate illnesses of both Commissioner C. R. Bell and Assistant Chief of Patrol Charles Bauder most of the duty of welcoming the deputies and officials fell to the lot of volunteer Deputy Captain R. E. Jeffries.

Major John L. Farley, executive officer of the Division of Fish and Game, spoke on the necessity of cooperation, both in regular and volunteer forces.

E. L. Macaulay, chief of patrol of the regular deputies, explained the close tie existing between the present regular deputies of the division and the volunteer forces, and how in many sections of the State

their mutual helpfulness results in the making of cases which would otherwise be lost.

Walter R. Welch, captain in charge of volunteer deputies, emphasized the necessity of the furtherance of establishment of quail sanctuaries throughout the State, and added, that he hoped another year would see at least 1000 of these inviolate refuges serving, instead of the 700 at present.

August Bade, superintendent of the State game farms, spoke on his experienees during years of game bird propagation work. He answered the query of "why the raising of pheasants instead of quail," by saying that the quail does not compare with the pheasant (certain breeds) in the number of hatchings nor eggs per year. He said that the electric brooders were fast replacing the good but unreliable hen in game raising.

J. S. Hunter, in charge of game refuges, was unable to be present, owing to illness in his family.

The many activities of the bureau of hydraulics was described by J. Spencer, in charge of that office. Spencer solicited the assistance of the volunteer deputies in locating the sources of pollution, and, said that E. A. Chan, located in Long Beach, is ever available and capable of coping with problems in this end of our State.

George Tonkin, U. S. Game Protector, was present and spoke on fish and game problems from a national and international standpoint.

"The Value of Nongame Birds" was the subject chosen by Leo K. Wilson, head of the bureau of education and research. He advised that the education department has available a most reliable and comprehensive library.

Although Governor James Rolph, Jr., found it impossible to attend, many notables throughout the State were present.

The annual pistol competition was held at the police range in Elysian Park. James Davis, expert two-gun marksman, instructed all present in the proper handling of a pistol, and the laws regarding its use. Davis and Dr. George F. Fiske, Jr., U. S. Olympic shot, held a competitive match. This match was so nearly perfect that at the end both men had won and lost approximately equally in the various styles of shooting. To these experts anything outside the nine ring was a bad shot at fifty yards.

After this match, exhibition shooting was done by both, such as, shooting the ash off cigaretts with guns upside down, shooting two targets, with a gun in each hand, and making tens on both targets at once.

In deputy target competition, Donald Maclain won a genuine deer skin specially tailored coat, donated by deputy Art Lenkeit as first prize. Deputy J. M. Bush won a $55 double sleeping bag air mattress. A $35 Divine fishing rod, a lambs wool sleeping bag, and a mounted 15 point Kaibab deer head, even to prizes for the ladies of velour auto eushions, comprised a list of most desirable prizes. The Walter R. Welch perpetual trophy was won by Deputy Maclain.

Much eredit is due the Los Angeles deputies for the able manner in which they handle convention affairs—D. Foss, Venice, California.

NATURE HATCHES EGGS

A bird that displays something of the languor of the tropics is described by Dr. T. A. Jaggar, director of the Hawaiian Volcano Observatory. The malau bird, a unique inhabitant of Niuafou, one of the Tonga Islands, digs a hole three to five feet deep in the slope of the warm volcanic sand, lays her long, pink egg in the bottom, scratches her way out, filling the hole behind her with sand, and lets nature do the rest. The sun heats the sand to from 85 to 95 degrees Fahrenheit. If the natives do not molest the egg and it is allowed to hatch, the young bird digs it own way out. The egg is the size of that of a goose. In another effort to save labor, different hens reoccupy the same holes over and over.—*Science*, Vol. 73, No. 1897, May 8, 1931, page 14.

FOREST SERVICE ESTABLISHES PRIMITIVE AREAS

In order to preserve for the public the conditions which existed in the pioneer phase of California's development, sixteen tracts, termed "primitive areas," embracing 1,744,412 acres in fifteen national forests of the California Region, have been designated by R. Y. Stuart, chief of the U. S. Forest Service, according to notice just received by regional forester S. B. Show. These areas are part of the wilderness country of the Sierra and Coast Range, and except for trails and such roads as are necessary for fire protection and administration, no permanent improvements of a recreational nature will be permitted.

"The recreational resources of the national forests of California are being utilized to such an extent that some action must be taken to provide areas where truly natural conditions can be found," stated Mr. Show. "Much of what a few years ago was wilderness is now given over to highways with summer resorts, auto camps and gas stations. The camper who desires a vacation in the real wilderness will now be assured of vacation grounds where environment, transportation, habitation and subsistence are almost the same as when the first white settlers came to California."

The primitive areas established by the Forest Service are as follows:

Agua Tibia—25,910 acres, in the Cleveland National Forest, including part of the Agua Tibia range and peak of that name. From these mountains wonderful views can be obtained of the desert and ocean.

Caribou Butte—16,442 acres, in the Lassen National Forest. This is a region of volcanic buttes with many interesting lava formations. Elevation from 6000 to 7000 feet.

Cucamonga—5000 acres, in the San Bernardino National Forest. A region varying from rolling benches to steep cliffs, immediately adjacent to intensively used recreational centers. Elevations from 5000 to 9000 feet.

Desolation Valley—41,380 acres, in the Eldorado National Forest. Located in a high Alpine country of granite peaks and skyline lakes, with elevations ranging from 6500 to 10,120 feet.

Dana-Minarets—82,181 acres, in the Mono and Sierra National Forests. A portion of the Minaret Range, including Mt. Dana, 13,050 feet, and Mt. Lyell, 13,090 feet, a region of perpetual snow, with gorges, mountain meadows, glaciers and glacial moraines, form the main features of this High Sierra country.

Emigrant Basin—98,044 acres, in the Stanislaus National Forest; on one of the routes of the covered-wagon pioneers. An area of rugged granite peaks, the highest being Leavitt Peak, 11,575 feet.

High Sierra—761,790 acres, in the Inyo, Sierra and Sequoia National Forests. A region of perpetual snow with many mountain lakes; the headwaters of the Kings River and other streams. Typical High Sierra country with elevations from 4000 to 14,000 feet, and many peaks above 12,000 feet.

Hoover—20,540 acres, located in the Mono National Forest along the crest and east side of the High Sierra. Contains many mountain lakes, meadows and numerous peaks over 13,000 feet elevation.

Marble Mountains—237,527 acres, in the Klamath National Forest, so called because of the limestone formation which resembles white marble. A high wilderness country with many lakes and streams.

Middle Eel-Yolla Bolly—143,386 acres, in the California and Trinity National Forests. Located on the headwaters of the Trinity River and smaller streams. A country of virgin forests and rugged topography with several high peaks.

Salmon-Trinity Alps—196,420 acres, in the Klamath, Shasta and Trinity National Forests. A region of granite peaks ranging from 7000 to 8000 feet, with remnants of former glaciers and showing the results of glacial action. Contains many Alpine lakes and streams.

San Gorgonio—20,000 acres, in the San Bernardino National Forest along the summit of the San Gorgonio Range. Elevations vary from 7000 to 11,485 on San Gorgonio Peak, the highest mountain in southern California. Topography rough and broken and in some places precipitous.

San Jacinto—23,291 acres, in the San Bernardino National Forest. A picturesque region surrounding San Jacinto Peak, 10,805 feet, from whose summit can be seen a wide view of mountains and deserts.

South Warner—70,682 acres, in the Modoc National Forest. Located on a high ridge, 15 miles long, overlooking the Nevada deserts. This ridge is a "fault" which resulted in the formation of the Warner Mountains. There are many glacial lakes and peaks over 9000 feet.

Thousand Lake Valley—16,335 acres, in the Lassen National Forest. A rugged timbered area surrounding McGee Peak, containing many lakes scattered in the pine and fir forest.

Ventana—45,520 acres, in the Monterey Division of the Santa Barbara National Forest. A rough country with elevations from 1200 to 4800 feet on the headwaters of the Carmel and Big Sur rivers.

RATTLESNAKES ARE BORN

Rattlesnakes afford a never ending source of interest to readers of the news. This is probably due to the fact that these reptiles carry death dealing poison fangs in their mouths, and everyone is interested in agencies that involve life and death. At Firebaugh, in Fresno County, someone has brought up the subject of "rattlesnake eggs." A story printed in the *Fresno Bee* says that scientists settled this question some time ago. That is, after prolonged observations, it was determined that little rattlesnakes are born and NOT hatched from eggs.

ROCKY MOUNTAIN SPOTTED FEVER NOT CONFINED TO PACIFIC NORTHWEST

A disease of the Rocky Mountain spotted fever type has been identified by the United States Public Health Service as occurring in states in the eastern and southeastern sections of this country. Until recently, it has been thought that Rocky Mountain spotted fever existed only in the western part of the United States, showing its greatest prevalence in Montana and adjoining states. There is every reason to believe that the type of the disease just reported for the eastern and southeastern states is spread by ticks, as is the type of the disease that is found in the Rocky Mountain section of the country. This disease is severe in some of the northwestern states, the mortality running from 60 to 90 per cent.

FLEAS MAY TRANSMIT ENDEMIC TYPHUS FEVER

The United States Public Health Service reports that there is strong evidence to indicate that, in this country, fleas may be the means of transmission of typhus fever from person to person or from a possible rodent reservoir to human beings. It has been known for many years that the old-world type of typhus fever is transmitted by the body louse. Study of a milder type of this disease which is found in the United States indicates that the body louse may not be involved in the transmission of the type of disease that is found in this country. The result of this study is of considerable epidemiological importance to public health authorities in California and in other states as well.

INSECTS HIBERNATE LIKE BEARS

Insects that survive from one warm season to the next, sleeping through the winter like bears, prepare for the winter very much as bears do, by increasing the body store of fat. They further insure survival by getting rid of as much water as possible, making their body fluids difficult to freeze to the point of crystal formation, which would have fatal effects. Hibernating insects will freeze to death if their environmental conditions are disturbed, whether they are prepared for the cold or not. These are, in skeleton outline, the results of experiments by N. L. Sacharov, of the Agricultural Experiment Station at Saratov, U. S. S. R. They are set forth in a full technical paper in English in the American scientific journal *Ecology.—Science,* Vol. 73, No. 1889, March 13, 1931, page 14

WOOD TICKS CARRY DISEASE

Beware of the wood tick. These unpleasant, repugnant bugs are common carriers of disease. Most assuredly no person would care to harbor one as a running mate, but few of us think about the disease-carrying propensities of the tick.

The disease of tularemia is the main danger in this section of the continent and is usually contracted by human beings through the tick-carrying rabbit. Other small animals may also carry infected ticks.

Needless to say as soon as one feels a crawling foreigner upon his body he should remove the object as soon as possible. In case of infection, seek expert medical aid immediately.

DIVISION ACTIVITIES

BUREAU OF FISH CULTURE

The protracted drought has caused incalculable damage to the fresh water fish in California, particularly the trout. Despite the effort of our crews, wardens and others the loss of trout in the Sierra Nevada mountains has been severe. Not only have many fish perished, but the low condition of the water in many lakes and streams has caused the fish to gather in small pools where they fall an easy prey to their natural enemies as well as to many fishermen who took advantage of the situation.

Experiments are still being made in the trout hatcheries with several brands of prepared fish food, but to date no substitute has been found for the regular foods that can be considered a balanced food for the fish. Some of the preparations may be used part of the time, thus reducing the expense of purchasing liver, melts, etc., which are a balanced food when properly fed. We hope to make a full report on this subject before long.

The water level in Lake Tahoe is about the same as it was early in July, while the water in the Truckee River and all streams flowing into the lake are somewhat lower. The water level in the lake is up to the rim as established by the head gates in the Truckee River and a small amount of water could be drawn off if the gates were open. There is still some water being drawn into the river from Donner Lake; but the lake level is becoming quite low and the flow of water through Donner Creek will not last much longer.

Snow Creek Station is being studied with the object of installing a filtration system as the Bureau of Sanitary Engineering discovered pathogenic bacteria in the water of Snow Creek. This condition is not due entirely to the contamination of the water from the ponds as a larger bacterial count was found above the hatchery than below it. A filter system will soon be installed that we believe will remedy the condition.

The water in Benner Creek failed early in July, the first time in the history of the State. We are now sinking a well with the object of having a water supply should the protracted drought continue, as well as to enable us to get water by pumping should we have another freezing spell as we did last winter when it froze the creek up for several weeks. We hope these conditions will not occur again, but are preparing for any emergency of a like nature.

Basin Creek, Big Creek, Brookdale, Prairie Creek, Fort Seward, Almanor and Wawona hatcheries have had such a shortage of water that they could operate but for a short time this spring. The low warm water has, at a majority of the hatcheries, caused them to plant earlier than usual. The hatcheries that are in operation are all running on diminished supplies of water and it will take more than one winter of normal precipitation to give the streams and springs their usual supply; as the drought has continued so many years that it will take several years to restore the lakes with water to bring up the flow any-

where in California so that we can have the same amount of water as was to be found in the springs and streams fifteen years ago.

BUREAU OF FINANCE

August was a very busy month in all of the Division offices and particularly at Los Angeles. Although clerks in the southern office received some help from one of the deputies, it was necessary for them to labor from early in the morning until evening in order to keep abreast of the work. This same condition existed throughout the month of September.

The reason for such a rush for licenses is due to the excellent deer season now in progress. With the animals in plentiful numbers throughout the State the hunters have taken advantage of the opportunity to secure outdoor recreation and a change of diet.

BUREAU OF GAME REFUGES

Water conditions on the Los Banos Waterfowl Refuge are poor. There has been very little water available for irrigation in the district and hundreds of acres of cotton planted near Dos Palos have not had a drop of moisture. It is not likely that water will be available in the ditches until after the seasonal rains.

On account of the low water conditions on this refuge it was decided, in order to take care of other dry years, that we should put down a well of sufficient size and depth to furnish an emergency supply. It is interesting to note that at 153 feet below the surface, 90 feet above sea level, that a 4-foot juniper log was found. Samples of this wood were turned over to the Forest Service for identification. Part of the wood had turned to coal.

At the Gray Lodge Waterfowl Refuge water conditions are satisfactory. Birds began to show in goodly numbers on both areas during the early part of August. By the end of the month there were thousands of birds on both areas.

It was reported that at the end of August speckled belly geese had shown up in considerable numbers. This is the earliest that this species has been reported.

The deer season opened in districts 2, 2½, and 3 on the first of August. The daily record of tags of deer killed show a return of 5848 cards for the month as against 5958 for August of last year. This would indicate a kill of approximately the same as last year which was the heaviest year since the tag system was placed in operation.

During August, 17 lion bounty claims were filed. The same number were filed for August last year and this is five more than were claimed during the same month in 1929.

BUREAU OF PATROL

The first arrest under the new striped bass law was made in District 12 B, Sacramento River near Collinsville, on August 30. It is understood that some commercial fishermen have contributed towards the defense of this case and the entire affair will undoubtedly act as a test of the striped bass law.

The total number of arrests during August was 183 and the amount collected on fines was $7,240; last year for this same period, 220 arrests were made with fines totaling $8,212.

With the deer season open throughout the State the wardens have been very busy checking hunting licenses, deer tags, guarding refuges and performing many other important duties in the field.

The large number of forest fires in the State this year also presented many problems that vitally affected fish and game protection work and every cooperation was offered to both the Federal and State Forest Services to assist in dealing with the situation.

Our wardens have been and are very busy with fish rescue work. The continued drought has caused many live waters of California to become undesirable for fish life or to dry up entirely and in order to insure better prospects for coming seasons every effort was made to remove stranded fish to safe retreats.

Fish planting from the 29 trout hatcheries was also a very important problem this season and the wardens offered every possible assistance in this work.

BUREAU OF EDUCATION AND RESEARCH

All sections of California's open lands were represented this year in the exhibit of the Division at the annual State Fair in Sacramento. The fair lasted from September 5 to 12, inclusive.

The exhibit was erected under the direction of W. H. Shebley, in charge of the Bureau of Fish Culture. He has supervised the Division's State Fair exhibit for many years.

Sections depicted include the colorful rough lands of the south, the picturesque mountain country of central California and the wonderful redwood empire of the north. These representative territories were cleverly reproduced in the allotted space through the skill of W. F. Dabelstein, artist.

One entered the exhibit through the doors of a "log cabin." There, outside a great window, was a fresh water lake containing numerous trout. Beyond offered the great general scene. There were several waterfalls and numerous plants and trees, including the mysterious Joshua trees of the desert, in the exhibit and these gave a very natural color to the scheme.

The lighting effects were excellent. Through this medium the various changes of the day were made to appear. Not only that, but a typical mountain storm, with snow and moving clouds, was reproduced. Then, there was a great moon which shimmered on a distant lake after the storm had passed. This part of the exhibit was controlled by Edward Holtzmueller.

Glass aquariums were stationed at each entrance, enabling visitors to make close observations of our trout and spiny-rayed fish.

The exhibit was one of the best at the Fair, according to directors, and attracted thousands of persons.

Statistics were compiled of the hunting accidents which occurred in 1930. These figures are obtained from the clippings received from newspapers throughout the State. This compilation shows that 127 accidents occurred in 1930; statistics appear in detail in the reports at the back of this issue.

Various trips have been made by members of the Bureau to study field conditions, diseases among birds and game, and other important problems.

Leeture activities are being earried on at full eapaeity and Jaek Boaz was added to the staff in order to properly eare for this work in southern California.

BUREAU OF HYDRAULICS

Drought eonditions have made the work of this Bureau exeeedingly eomplex during the past few months and many inspection trips have been made into the field in an endeavor to make the work of eonservation as effeetive as possible.

An inspeetion trip was made to the upper Truekee River and the main Truekee River. The upper Truekee was not flowing over about 40 inches of water. No water was flowing out of Lake Tahoe into the Truekee River and the water in said river was purchased from Donner Lake by Nevada interests, said water being used for domestie purposes and to keep flumes from drying out too mueh. Reports, whieh it is believed are reliable, are to the effeet that great numbers of fish were killed at the Derby Dam on the Truekee River below Reno, Nevada. The Truekee River in the State of Nevada side is not flowing but merely standing in pools.

Water pollution problems in various parts of the State are being studied and mueh active and effeetive work is being done along this line.

BUREAU OF GAME FARMS

The planting of ring-neeked pheasants for the month of August totaled 2191, with 227 valley quail and 28 Mexiean bronze turkeys also turned into the fields.

A fine exhibit of game birds was furnished for the Sebastopol Apple Show and a similar exhibit was sent to the San Joaquin County Fair at Stoekton. The game bird exhibit at the California State Fair in Sacramento attracted a great deal of interest and attention and some fine eomment has been reeeived.

Quite a few returns on the eggs sent out for hateling are eoming in and many of them are very eneouraging. The sportsmen at Petaluma turned out 400 nice birds as a result of their efforts. Deputy E. W. Smalley, of Hanford, reports that 575 birds were released at the age of ten weeks from 1440 eggs furnished them. In almost every case these people are asking for the same service next year and want additional eggs.

Reports on turkeys in Mendoeino and Humboldt eounties indieate that the birds are taking hold even better than expeeted.

Work on the game farm at Chino, in southern California, is running at full eapaeity and sportsmen and sportsmen's organizations are taking a great interest in affairs. Plants are constantly being made in that part of the State and great eare is being taken to see that the land is suitable for the speeies introduced.

BUREAU OF COMMERCIAL FISHERIES

During the month of August sardines were very searee in Monterey Bay and the sardines which were taken for the eanneries were taken mostly outside the bay and above Santa Cruz. Ordinarily, sardines are most plentiful in Monterey during the month of August and September. This seareity of sardines in the bay is assoeiated with

abnormally warm water and the appearance in rather large numbers of unusual fish, such as barracuda, bonito and yellowtail. Mackerel and white sea bass were present in larger numbers than usual.

Sportsmen have been complaining that these game fish are becoming scarce in Monterey Bay and contend that this scarcity is caused by the taking of such large quantities of sardines for the canneries that there is not sufficient food left to bring the game fish into the bay. The abundance of game fish during an unusual scarcity of sardines apparently disposes of the sportsmen's theory. Our records of the commercial catch show that at the times barracuda are taken in the bay, bonito and white sea bass are also taken, and sometimes yellowtail. It is more reasonable to believe that the presence of these game fish in Monterey Bay is due to oceanographic conditions and that the abundance of sardines has little effect.

Another effect of the high water temperatures on the coast of California is the appearance of Mexican fish well up along the California coast. Heretofore swordfish have mainly been taken commercially off the coast of Lower California, but this summer there have been more of these fish taken off the coast of California than ever before. Nearly 150 swordfish had been taken near Catalina Island by the end of August, as compared with only 16 the entire season of last year. These Catalina swordfish were taken by pleasure anglers.

A great many tuna were brought into San Diego and San Pedro during August. The new tuna size limit law went into effect on August 14 and all incoming loads of the fish were inspected.

The high temperature of the water along our southern coast has diminished the size of the kelp beds, and some beds which are ordinarily quite large do not even appear on the surface.

The *Bluefin* has been very busy on patrol work. Early in August she made a patrol trip to San Diego, on which trip she brought back from that port the drag net which was taken near Oceanside some time ago.

The work of E. C. Scofield on the *Bluefin* in determining the spawning areas and drift of young sardines was brought to a close and he has returned to the Hopkins Marine Station at Pacific Grove.

Salmon investigation work on the Shasta River is showing very good progress. Merrill W. Brown, Junior Fisheries Researcher, reports that, to date, "we have counted 12,401 salmon through the Shasta counting racks, as compared with 355 at the same date last year. This season about 20 per cent of the run are grilse as compared with 60 per cent a year ago.

The counting method that is being used on the Shasta River this season is working very well. The river is clear and the research men can distinguish the fish very easily.

BUREAU OF FISH RESCUE AND RECLAMATION

It's an ill wind that blows no good! While the prediction that the lack of rainfall would be disastrous to fish life, and no doubt will be before rain falls again, at least in the Sacramento and some portions of the low San Joaquin valleys, it has been a blessing in disguise. It has been the practice of some of the gold dredgers in the Folsom areas to discharge the tailings into the local creeks. In some years of normal rainfall, this slush is carried into Elder Creek thence into the Hood

Canal and Snodgrass Slough, which are the spawning grounds of thousands of black bass, crappie, perch and sunfish. Last season this red soup appearing liquid destroyed every fish and egg in its path. This season, owing to the lack of rainfall, this deleterious substance reached but a small portion of the spawning grounds, consequently for the first 15 days of June of this year, this bureau has rescued 1,214,913 of the spiny rayed fresh water fishes in the same areas where but little rescue work was necessary last season. Of the above number 950,069 were black bass. All the waters from where the fish were taken were land locked. At this writing about 50 per cent of it is now dry ground.

To me and my net foreman, Abe Woodard, fish rescue work is most fascinating and interesting. When the nest of spawn is hatched, which in water of that temperature occurs in a few days, the young all rise to the surface, and from a distance the ten or more thousand little black bodies look like a mass of dark weeds. They remain in this condition for several days and are yet immune from the cannibal instinct of the parent fish and which still protect them. At this stage is the time we do the most efficient rescue work.

The one group of young fish may contain from ten to forty thousand. A large metal wash tub, with clean water, is placed on the bank near the water and with a six-foot square dip net placed carefully under them, the entire brood are lifted into the tub of water and hurried to the nearest permanent water which contains aquatic growth and water larvae in which the youngsters find food and shelter from their enemies. Later, when they attain a size of several inches, they can leave these water sanctuaries and paddle their own canoes.

Later the parent fish are seined out and returned to the water from where they came and if not caught, to return next season. In the States where these species are propagated in semiartificial hatcheries, the minimum of cost to propagate them is from $25 to $40 per thousand. It does not require much arithmetic to demonstrate the value of this piece of conservation.

VOLUNTEER DEPUTIES

In connection with the work being done by the volunteer deputies for the establishment of quail sanctuaries and game refuges in an effort to replenish the supply of quail through natural channels in open breeding grounds from the nucleus of wild birds in the field—a prize contest for the control of predatory birds and animals will be conducted, the terms of which are as follows:

To the volunteer deputy, who, between September 1, 1931, and March 1, 1932, sends to the office of the Division the greatest number of bobcat stomachs will be awarded a prize consisting of the choice of an E. C. Powell hand-made fly rod, or a Winchester rifle, donated by Mr. Albert Lindley of Stockton, and to the volunteer deputy, who, during the same period of time, sends to the Division the greatest number of stomachs and tails of sharp-shinned and Cooper hawks will be awarded a prize consisting of a genuine Navajo rug, donated by Volunteer Deputy E. W. Ross of Los Angeles.

To prepare the stomachs for shipment, remove them from the bird or animal, place them in a solution composed of one part formalin to ten parts of water. Allow to remain in the solution from 24 to 48 hours, remove, drain, mark the stomach and tail of each hawk

with a corresponding number, and mail to the Division together with your name and address, the date and locality where the bird or animal was killed, its species and sex.

In connection with this contest arrangements are being made to award a suitable prize to the volunteer deputy who, during the time of the bobcat and hawk contest, sends to the Division the greatest number of stomachs of the following species of birds and mammals: great horned owl, sharp-shinned, Cooper and duck hawks, crow, black-billed magpie, blue jay, opossum, coyote, bobcat and semiwild, roaming domestic house cat.

LIFE HISTORY NOTES

STRIPED BASS AT SAN DIEGO

Coburn F. Maddox, in charge of the San Diego district for the Bureau of Commercial Fisheries, reports under date of June 8, 1931, that he was informed three striped bass had been caught by anglers near La Jolla. He found one of these bass, a seven pounder, on display at the Stanley Andrews sporting goods store and learned that it was caught by Frank Dexter while surf fishing at the Scripps Institution of Oceanography. This report is of interest as it is the first verified report which has come to our attention of striped bass being taken south of Monterey Bay, although it is known that these introduced fish are becoming more numerous and have extended their range northward to Coos Bay in Oregon.—N. B. Scofield, 510 Russ Building, San Francisco, August 17, 1931.

STRIPED BASS

Howard R. Hill of the Los Angeles Museum reports the receipt of some striped bass, which were taken by sport fishermen at San Clemente, a small seacoast town in southern California. The specimens were young ones, around three and one-half inches long, and were reported to be "thick" in the region where they were taken. Local fishermen were unfamiliar with this species, and took specimens to Mr. Hill for identification.—Lionel A. Walford, August, 1931.

A PUG-HEADED RAINBOW TROUT

The malformation known as pug-headedness is uncommon but not rare among fishes. It is seldom that reliable information and good illustrations are brought to the attention of interested ichthyologists, however. The Division of Fish and Game has been fortunate in receiving a photograph of a deformed rainbow trout caught by Mr. Fred Hartzell of Susanville in Butte Lake, Lassen Volcanic National Park on June 21, 1931.

Dr. E. W. Gudger of the American Museum of Natural History has made a careful study of pug-headed fishes. In his published articles* he makes reference to a number of cases of the malformation which were brought to his attention. It appears to be most common among

* An adult pug-headed brown trout, *Salmo fario*, with notes on other pug-headed salmonids. American Museum of Natural History, Bulletin, vol. 58, art. 10, pp. 531–559, 1929.

Pug-headedness in the striped bass, *Roccus lineatus*, and in other related fishes. American Museum of Natural History, Bulletin, vol. 61, art. 1, pp. 1–19, 1930.

carp, although nearly all kinds of fish have been observed to be susceptible to the abnormality. The unusual appearance of the "forehead" can be noted in the embroyo and is thought to be due to disturbances in the endocrine system. There are two general manifestations of the abnormality; the snout is flattened and depressed so the rudimentary upper jaw appears to have been forced downward and backward, or the premaxillaries are pushed back into the buccal cavity to form the roof of the mouth and the maxillaries are diminished in size and forced into a vertical position. The latter type of malformation is represented by Mr. Hartzell's specimen and is clearly shown in the accompanying photograph.

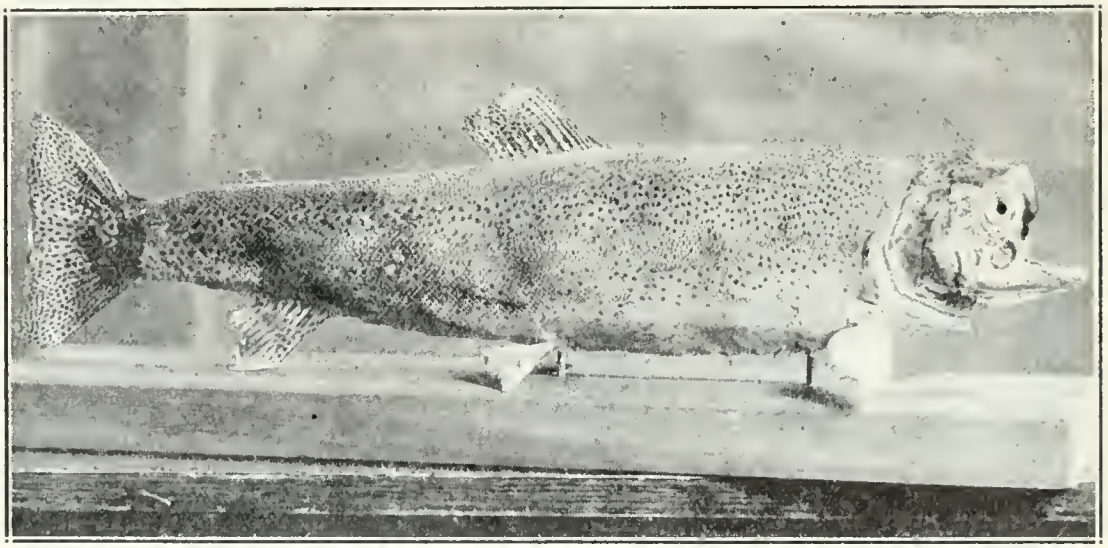


Fig. 135. Adult pug-headed rainbow trout taken in Butte Lake, Lassen Volcanic National Park, by Fred Hartzell, June 21, 1931. The malformation of the skull and upper jaw is rather uncommon among fishes. Photo submitted by Hartzell, August 15, 1931.

Most of the specimens on record are of immature fish, but the fact that some are full grown fish in good condition leads to the belief that feeding is not seriously hampered by the queer shape of the mouth. The Butte Lake trout was apparently in good condition and had attained to the weight of three pounds and six ounces.—Richard S. Croker, California State Fisheries Laboratory, August 15, 1931.

AN UNUSUAL RECORD OF THE BONITO (SARDA CHILENSIS)

Captain C. M. Bouton of the patrol boat *Quinnat* sent in a specimen of the California bonito *(Sarda chilensis)* taken in a shad net in the Suisun cutoff on May 12, 1931, by a commercial fisherman, by name Pete Volles. The California bonito ranges from San Francisco to Patagonia. It grows to a length of two or three feet and weighs from twelve to sixteen pounds. The usual food is anchovies and squid. The bonitos range the high seas in large schools moving up and down the coast with the changing seasons. The specimen in question may have become lost from its fellows, joined a school of shad and simply continued with them when they started up the river. As only the head and tail of the fish were sent in the size can only be guessed at. It was about 18 inches long.—Paul Bonnot, July, 1931.

KILLER WHALE IN CARQUINEZ STRAITS

On the afternoon of July 24, George Peters was with a party in a launch trolling for striped bass in Carquinez Straits off Benicia. The writer was in another launch nearby. Peters and some others were swimming when the whale was first sighted about one hundred yards from their boat. We thought it was a shark as all we could see was the long dorsal fin and part of the back as it appeared on the surface for a few moments. The swimmers boarded their boat and followed it. Peters had a rifle on board and whenever the whale appeared on the surface he fired at it, firing about twenty shots in all. When it did not appear again, all came ashore, not believing any of the shots had taken effect.

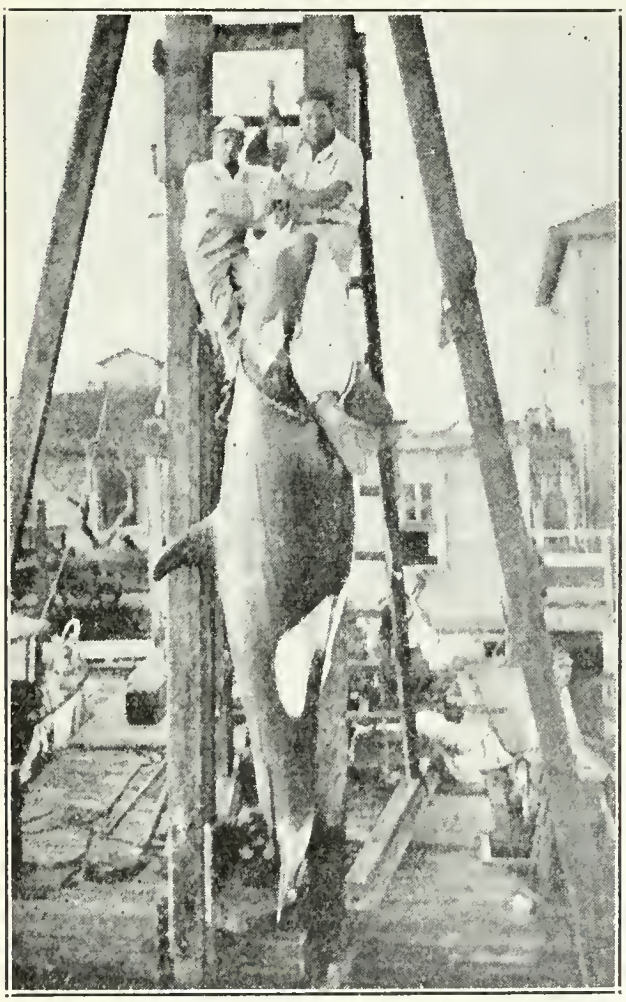


Fig. 136. Killer whale shot by fishermen in Carquinez Straits. The mammal was "playing around" near the new Southern Pacific Railroad bridge at Martinez. They are fast, powerful, savage and exceedingly predacious. Photo submitted by C. B. Williamson, Benicia, August 6, 1931.

About an hour later another fisherman found the body floating on the surface and towed it to the G. W. Hume wharf, where we hoisted it up on a pile driver.

There were many conjectures as to its identity at first, but it was positively identified through a description in the National Geographic Magazine and verified by two old whalers, who later viewed it, as a killer whale.

It was twelve feet six inches long, and, as nearly as we could estimate, weighed about 2500 pounds. It had sharp, pointed teeth in both the upper and lower jaws. The dorsal fin was about two feet long, and it was black with white underneath and over the eyes.

There were several others reported seen in the vicinity and there had been rumors that some large sharks had been seen in the straits, so it is evident that a school of these killers found its way into the bay and had been mistaken for sharks.

We exhibited the whale for two days—two or three thousand people viewing it.

It was exposed to the hot sun and spoiled rapidly, so on the third day we towed it up in the tules and anchored it at high tide where it would not drift.

Am enclosing a photograph taken when we first raised the whale, which may prove of interest. George Peters is at the left.—C. B. Williamson, Benicia, August 6, 1931.

On July 24, 1931, a 16-foot killer whale was killed near the Southern Pacific Railroad bridge at Benicia. Two Benicia fishermen, George and Matt Peters, brought the animal in after shooting it with a rifle. The killer whale (*Orca gladiator*) is primarily a whale of the open sea and this record is rather unusual.

The killers grow to be 25 or 30 feet long. The color varies, but is usually some combination of black and white. They have ten to thirteen strongly recurved teeth and a long, pointed dorsal fin.

Killers are predacious. They are fast, powerful and savage. They kill and eat the largest sea lion bulls and about the only animals in the sea which do not fear them are the sperm whales and full grown walrus bulls.—Paul Bonnot, 510 Russ Building, San Francisco, California, July 29, 1931.

TROUT AND WATER TEMPERATURE

Several investigators of the Biological Board of Canada have recently published articles dealing with their experiments on the rate of growth of trout in relation to the water temperature. They find that most trout can be hatched and raised successfully in a temperature of from 35 to 55 degrees Fahrenheit. One investigator records the breathing rate of his fish. At low temperature they breathe slowly, the rate rising with the temperature of the water until an approximate temperature of 80 degrees Farhenheit is reached. At higher temperatures than this the rate of breathing slows down. A factor not mentioned by either of the papers is the oxygen content of the water at varying temperatures. It is a well known fact that the lower the temperature of the water the higher the oxygen content. This would account nicely for the fact that the fish breathe faster in warmer water than in cold and that after reaching an optimum temperature the fish would be partly stupefied by the lack of oxygen and slow down its breathing rate. The colder water required by trout, having a high oxygen content, would be conducive to the growth of good species as well as supplying the fish with plenty of oxygen, thus supplying the two main ingredients which would make for larger fish.—Paul Bonnot, July, 1931.

FALL SHORE BIRD MIGRATION STARTS EARLY

The south bound migration of shore birds began early this year.

At Elkhorn Slough young willets, along with adults, put in their appearance in considerable numbers during the second week of July. On July 12, when I visited that section, I saw about seventy-five willets, about one-third of which were young birds. Also, a considerable number of godwits and the smaller sandpipers. There were two Hudsonian curlews also, but these were possibly birds that did not go north to breed. There were about forty northern phalaropes on a small pond nearby which had probably just returned.—D. D. McLean, 510 Russ Building, San Francisco, California.

BIRD WEAVES OWN NOOSE

While making motion pictures of the waterfowl on the State refuge near Los Banos during the early summer I chanced upon the nesting site of a cliff swallow colony under a bridge.

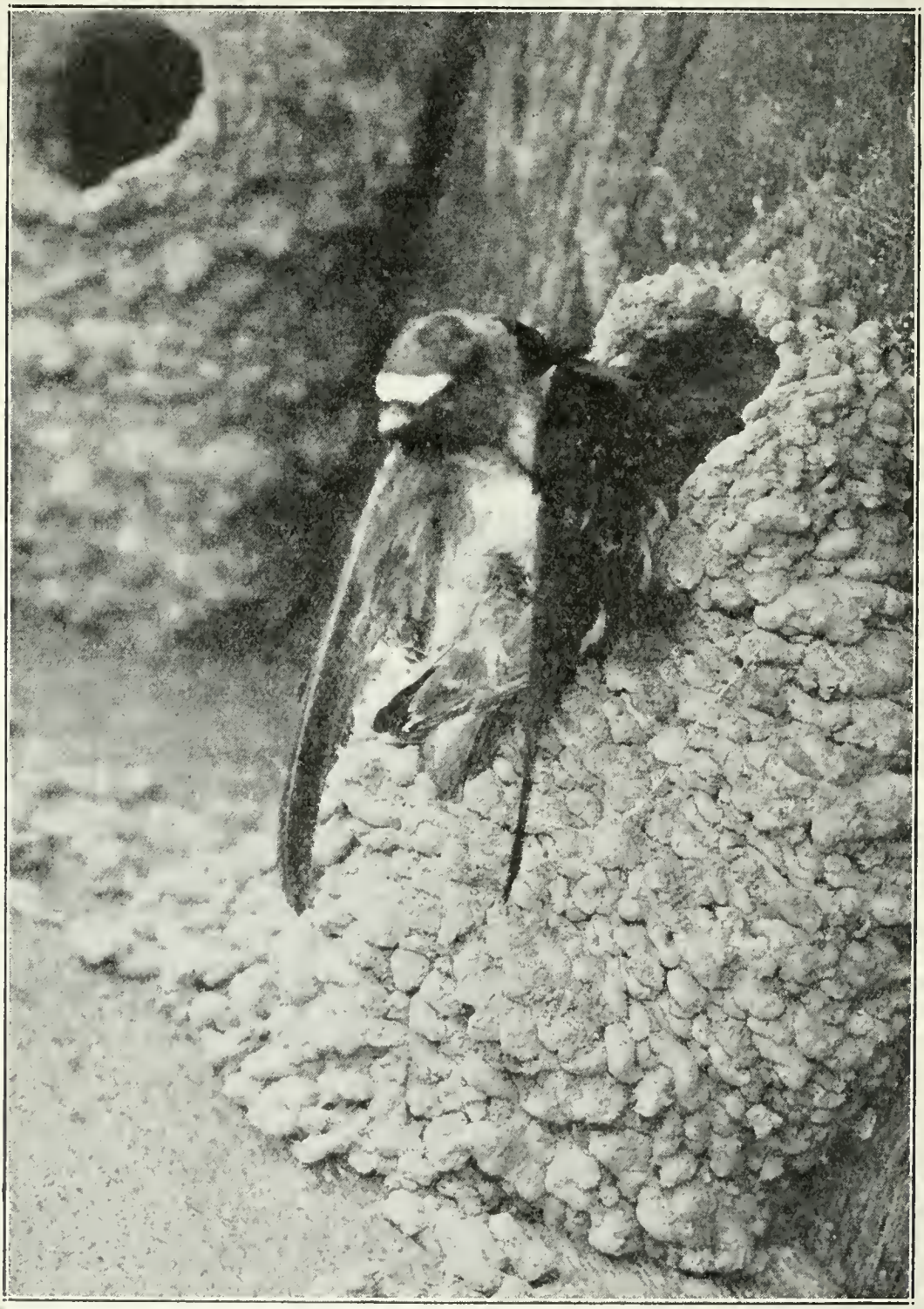


Fig. 137. This little cliff swallow fashioned its own noose. Photo by E. S. Cheney, May, 1931.

Noting the steady flight of the birds to and from some mud banks in the immediate vicinity I decided to investigate the manner of nest building from a very close point. The swallows appeared to form mud

pellets with their bills and then stick them in place on the under side of the rough boards with saliva.

After watching the "masonry" proceedings for an hour or more I intruded close enough to investigate the inner construction of the nests. The swallows seemed quite disturbed and voiced their disapproval with distressful cries.

While prowling around spying on the colony homes I discovered one of the swallows hanging limply below its home entrance. It apparently had been dead for a number of hours. Close observation revealed that one of its feet had become entangled in a section of horsehair that was woven into the nest in such a way as to form a loop.

I noticed that the nest was lined with feathers, contained eggs and was otherwise in good order. Whether the other bird had deserted the nest following the tragedy is a question I was unable to ascertain at the time.—E. S. Cheney, 1825 Fifth Ave., Oakland, California, July, 1931.

CHIVALRY AMONG SQUIRRELS

During the month of April I was attracted by an unusual cry of a squirrel at Seacliff Park in Santa Cruz. The sound was more like an angry squeal.

Peering through an opening in some brush I saw two squirrels rolling in the dust in deathly combat. One animal was of the ground variety and the other a tree squirrel. Up on a post nearby another tree squirrel watched the proceedings with "feminine" interest.

Suddenly the tree squirrel broke from a desperate clinch, bounded a short distance up a tree trunk near at hand, then turned and glared at his adversary below. After a few seconds the tree squirrel leaped upon the back of his opponent and the battle waged with renewed vigor. Around and around they went unmindful of my slow approach to ringside.

This leaping attack was executed three times by the tree squirrel before victory turned in his direction. During the final stages of the battle the weakness of the ground squirrel became very apparent.

When his opponent was roundly thrashed and fatally wounded the tree squirrel released his hold, called his "fair damsel" from the post top and together they disappeared into the depths of the dark foliage.

After a few feeble struggles the ground squirrel expired. I did not see the start of the battle, or had no inkling as to the real cause, but from the attitude of the coy "miss" on the post top I have my convictions—yes, I have my convictions.—S. Ward, 34 Redwood street, Santa Cruz, California, July, 1931.

DEER APPARENTLY WANDER IN SEARCH OF WATER

During this, our driest summer, it has been noted that deer have been seen in the most unusual locations.

A spike buck was seen out in the middle of the Santa Clara Valley below Morgan Hill under an oak tree. Another spike buck was noted lying in the shade of an apricot tree just south of the Alum Rock avenue road, fully a mile out in the populated orchard section of the same valley. A doe was seen looking for water along Coyote Creek in the central part of the valley.

It is presumed that all these animals were in such peculiar locations due to lack of water in the hills.—D. D. McLean, 510 Russ Building, San Francisco, California.

WHITE QUAIL

An excellent photograph of a white or albino quail has just been received by Walter R. Welch, captain in charge of volunteer deputies, from Bert B. Williams of Coalinga. The bird is a fine specimen and a letter, accompanying the photo, reads:

In regard to the white quail, the one you have the picture of, is very much alive. I think it was three years ago when I turned this bird over to the university; they have it in Berkeley, I understand, and you can see it there.

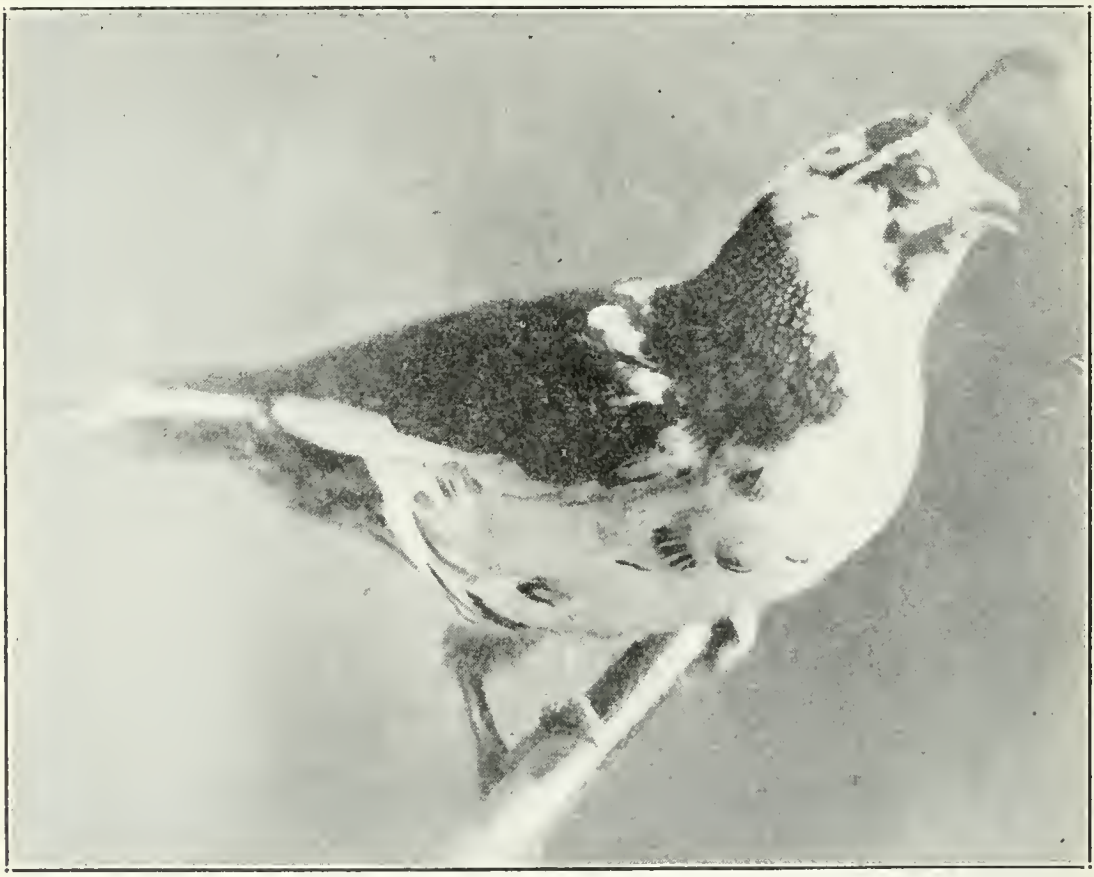


Fig. 138. Albino or "white" quail are always a source of interest to naturalists. Several specimens of these birds have been noted on a ranch near Coalinga. Photo submitted by Bert B. Williams, July 30, 1931.

This white quail is five years old. The bird is tame and was sitting on a pencil when the picture was taken. I noticed these white quail for the first time about five years ago. There were twenty-two of them. When I stocked up the farm with quail I noticed a pair of white ones in the covey. Now there are quite a few white quail on my property.

There are also some of them in White Creek. I don't know why these birds are white. I understand that the white quail at Berkeley is doing very well.

I notice that some of the young quail this year have quite a few white feathers so I may discover another covey of them next year.

CRABS AND SPINY LOBSTERS

On June 8, 1931, Coburn Maddox reports that, while at San Onofre a few days before, he found quantities of broken pieces of lobster shells which had washed onto the beaches. It was evident that a large number of lobsters had recently gone through the moulting process.

Observations of this sort, with accurate dates, are of great value in gaining a knowledge of the essential facts in the life history of our shellfish and we hope others will send in reports of this sort. Lobsters and crabs in any one region moult at a fairly definite time each year but the time may be quite different in different localities. The moulting of crustaceans is usually associated with the time of breeding and has a bearing on the question of what is the proper closed season. From just such observations, it was found that the market crab moults or sheds its shell about a month later near Eureka than it does near San Francisco, and that is the reason the crab season is a month later at Eureka. Do not hesitate to send in your observations for fear you will be only repeating what is already well known, for there is a lot we do not know about our commonest and most important fish and shellfish.

On June 4, 1931, Captain Antonio Sabella, of the San Francisco Crab Fishermen's Association, reported that he had recently seen the market crab, *Cancer magister,* in the process of moulting. The crab was seen buried in the sand in the edge of the water at the extreme of a low tide, on one of the beaches near San Francisco. The cast shell was mostly above the sand, while the soft-shelled crab was in the sand just beneath it and not yet entirely out of the old shell. The market crab is adapted for covering itself in the sand and, as it is almost helpless for a time after moulting due to the softness of its shell, it is evident that this crab covered itself in the sand before the moulting process began and that the crab, instead of backing out of its shell, pushed the old shell up and out of the sand. The market crab is provided with areas of short hairlike processes on the front of its shell and on the inside surface of the appendages which bear the pincers, so that when the pincers are folded up against the crab's body, the hairy areas on the pincers meet those on the front of the crab's shell. In the process of breathing, the water is sucked in through this hairylike tangle and is thus freed of sand before the water is passed through the gill chamber. With this special adaptation, the crab is able to cover itself just under the surface of the sand so that only its stalk eyes protrude. Here it is supposed to lie in wait for any small fish or other animal to approach within striking distance of its powerful pincers. It is doubtful if this method of feeding has been actually observed. The crabs caught by our commercial fishermen are caught in traps to which they are lured by bait composed of fish. Knowing of the crab's habit of covering itself in the sand, it has been supposed that at the time of moulting it takes refuge in the sand. However, this observation of Captain Sabella is the only instance we know of where the moulting process of this species of crab has been observed.

A number of years ago we received frequent complaints that large numbers of dead crabs had washed ashore on the sand beaches north of San Francisco. Usually these were soft-shelled crabs, it was reported,

but frequently they were hard-shelled as well. Crab fishermen who made these reports claimed that the crabs were killed by the paranzella nets which are dragged over the bottom by large boats for the purpose of catching soles and sand dabs. These dead soft-shelled crabs on the sandy beaches of Marin County have been the principal cause of a feud between the crab and paranzella fishermen. In trying to learn more about this wholesale destruction of crabs, I ran across a very intelligent Norwegian crab fisherman living at Sausalito, who had on a number of occasions observed these dead crabs. I had found that some of the complaints were caused by the empty cast shells coming on the beaches, but this Sausalito crab fisherman stated that he had observed large numbers of dead soft-shelled crabs on the beaches. He was sure, however, that the paranzella nets were not responsible. He had observed, he said, that these dead crabs were always where there was a sand beach and not where the shore was rocky. He had also noticed that the destruction followed an extreme low tide and when a heavy ground swell was running. It was his belief that the crabs resort to the sand beaches just outside the breakers to cast their shells, and that if at this time, when they are in a rather helpless condition, a low tide and heavy ground swell causes the surface to break far out, the helpless crabs are caught and killed by the surf and left on the beach by the next high tide. He did not say if he knew whether the moulting crab buries itself in the sand or not, and we did not know enough about crabs at that time to ask him.

It is known that the market crabs pair at about the time of moulting but whether mating occurs just before the female sheds her shell or shortly after, as is the case with the blue market crab of the Atlantic coast, is not known. After fertilization, the eggs are carried for several months within the body of the female before they pass out and become attached to the swimmerets where they are protected under the broad tail flap. At the time the eggs are extruded and become attached under the tail, the female takes refuge in the sand. We learn this from observations made several years by former Deputy Ed. Moody who, when stationed at Santa Cruz, observed that Pismo clam diggers near Capitola occasionally mistake a small elevation in the sand in the edge of the water at extreme low tide for the hiding place of a clam. On pulling it out with their clam rake, it proved to be a crab. In each case the crab was a female, and under the tail flap and attached to the swimmerets was the mass of eggs which had been but recently extruded, as was evidenced by their bright reddish color. After reporting this at the San Francisco office, Mr. Moody at our request sent up a couple of specimens, which were for a time kept in a preserving fluid. Unfortunately, the label on these crabs was lost, so that we are unable to fix the date. The month was probably September or October, for the Pismo clam season was closed from May 1st to August 31st and the date must have been after the opening of the season on September 1st. We can be quite certain it was not just before the clam season closed, for that would be before the crabs shed their shells.

HUNTING ACCIDENTS, 1930

Number of persons killed	33
Number of persons wounded, not killed	94
Number of self-inflicted accidents	
Fatal	17
Nonfatal	58
Number of accidents inflicted by others	
Fatal	16
Nonfatal	36
Occurred while hunting large game (deer, bear, etc.)	
Fatal	9
Nonfatal	18
Occurred while hunting small game (rabbits, duck, quail, etc.)	
Fatal	15
Nonfatal	34
Occurred while hunting unknown game	
Fatal	9
Nonfatal	42
Number mistaken for game or other wild creatures	
Fatal	4
Nonfatal	5

HUNTING ACCIDENTS, 1930—KILLED

Name	*Shot by*	*Date*	*Locality*	*Circumstances*
Arnerich, Sam (14)	Self	Nov. 23	Near Fairview	In pulling gun through fence by barrel, trigger caught on wire and discharged gun.
Barrett, John W.	Self	Feb. 28	Near Cannon's Resort—Almaden Creek	Found dead with rifle by his side, by searchers when he failed to return from hunting trip.
Betcharbs, Maurice (15)	L. Warner	Feb. 10	Near Stockton	Squirrel hunting. Gun accidentally discharged killing Betcharbs.
Brady, Alex (31)	Unknown	Oct. 15	Hale's Crossing—along Rubicon River	Deer hunting. Accidentally shot by unknown hunter.
Calvin, Guy	H. Houx	Sept. 18	Tehama County—Near Buck's Springs	Deer hunting. Believed bullet ricocheted from tree.
Coghlan, John J.	Self	Sept. 31	Near Melones	Deer hunting. Rifle accidentally discharged as he was crawling over rocks.
Comber, George	Self	Jan. 15	Near Dixon	Duck hunting. He was pulling shotgun from back of the car. Trigger entangled with cords was jerked back, causing it to fire.
Coon, Everett A.	Self	Oct. 13	Fish Camp, Pt. Magee—Mariposa Co.	Duck hunting. Gun accidentally discharged as Coon was entering auto to return from trip.
Dobbs, Chas. E.	Self	Nov. 23	30 mi. E. of Oceanside	Return from hunting trip when gun discharged in removing it from machine.
Eikenshoffer, Ruth	Self	Feb. 15	Near Palmdale	Rabbit hunting. Gun accidentally discharged.
Forderer, G. S.	Self	Dec. 14	10 mi. E. of Fairfield	Duck hunting. Gun discharged while climbing out of barrel blind.
Gammon, Walter P.	Self	Dec. 25	Turlock Reservoir	Duck hunting. While in rowboat, gun accidentally discharged.
Grossman, Wm.	Self	Oct. 5	Old River—San Joaquin Co.	Duck hunting. Boat upset while they were repairing damaged motor.

Hale, Lemar	Self	Dec. 18	Santa Ana Canyon	Rabbit hunting. Viewing valley from steel tower of Edison Co., when gun accidentally touched live wire. Was instantly electrocuted.
Houghton, A. W.	Self	Sept. 21	Near Bald Rock Tehama Co.	Gun was leaning on rear fender of car, fell and was discharged, bullet striking car door and rebounding, hitting Houghton.
Johnson, Robt.	R. T. Goldsmith	Jan. 2	Taft, Calif.	Shooting accidental. Goldsmith, carrying 22-caliber rifle.
Kwartz, Ben	Paul Huryck	Nov. 28	Near E. Oakland	Shot at hawk, but hit companion.
Maretto, Paul	Emmett Shearer	Aug. 19	Santa Rosa, Marietta Rch.	Deer hunting. Maretto was mistaken for a deer.
Marshall, H.	John Black	Aug. 9	Mortimer Park	Returning from hunting, Black was attempting to put safety catch on rifle when it exploded, the bullet striking young Marshall.
Miller, Elmer	Wm. Ridge	Dec. 16	Pyramid Rock	Bear hunting. In attempt to rescue dog from bear, companion unexpectedly fired at bear.
Mulligan, Chas.	Unknown	Sept. 18	Near Lakeside San Diego Co.	Deer hunting. Source of shot unknown; believed to be stray bullet from another hunter.
Mulvey, Cyril	E. Robb	Feb. 16	Dry Lake, Kern Co.	Rabbit hunting. Robb, in taking shell from repeating shotgun, accidentally fired the piece and caused Mulvey's death.
Nelson, G. W.	Robt. Norton	Feb. 2	Near Buck Meadows Mariposa Co.	Hunting and trapping trip. Norton fell, his rifle accidentally discharging and bullet striking Nelson.
Phillips, D. W.	Self	Aug. 10	Lake County	Deer hunting. Rifle discharged as Phillips was getting out of auto, bullet striking him and causing instant death.
Rasore, L. S.	J. Shaw	Dec. 29	Near Colusa	Goose hunting. Shooting accidental.
Renfree, R. J.	A. Silva	Oct. 15	Near Nevada City	Deer hunting. Accidentally shot by companion as he left "stand."
Ridgway, H. R.	Self	Sept. 9	Near Brawley	Dove hunting. Accidentally dropped gun, thereby shooting himself.
Rudick, John	C. Everett	Dec. 7	Near Los Banos	Duck hunting.
Spencer, W.	Self	Sept. 28	Near Bayside	Rabbit hunting. Accidentally shot as he was pulling gun through fence.
Stansbury, R. R.	Self	Nov. 20	2 mi. W. of Chowchilla	Rabbit hunting. Gun accidentally discharged from rear seat of car.
Watson, John	D. A. Shea	Dec. 25	Near Susanville	Goose hunting. Shea fired at flock overhead, but gun not aimed high enough causing bullet to hit Watson.
Wickham, F. F.	Self	Sept. 28	Kettlerock	Stumbled and fell, shooting himself through abdomen.
Williams, Arthur	Unknown	Oct. 3	Near Oroville	Deer hunting. Died of shock and hemorrhage resulting from gunshot wound inflicted by unknown persons.

HUNTING ACCIDENTS, 1930—INJURED

Name	*Shot by*	*Date*	*Locality*	*Circumstances*
Adams, Arthur	Self	Nov. 27	Near Live Oak	Duck hunting.
Amyx, Claude	Self	Jan. 10	Near Ahwahnee Madera Co.	A piece of flying metal pierced the eyeball when gun accidentally exploded.
Anderson, Louis	Self	Apr. 12	Berkeley Hills Alameda Co.	Hunting with "home made" gun, which failed to explode, but in examining it, discharged.
Avery, James (23)	K. Atkins	Sept. 16	San Jacinto Mts. Riverside Co.	Deer hunting. Atkins' gun accidentally discharged.
Norman, Barker (14)	Self	July 18	Near Sonora	Rifle slipped off fender of car, striking ground and discharging.
Brazil, M. P.	Self	Mar. 23	Near San Gregoria San Mateo Co.	Magazine of rifle accidentally exploded.
Brand, Wilbur E.	Self	Nov. 2	Near Gridley	Placed shell of wrong caliber, which lodged in chamber and later, when other shell was fired, gun exploded.
Brown, Homer	A. Smith	Aug. 1	Colusa County	Deer hunting. Trigger of gun was snagged in brush and cartridge exploded.
Burdick, Clifford	Self	July 30	Near Turlock	Rabbit hunting. Accidental discharge of rifle.
Burnell, Canada	H. C. Swyter	Aug. 4	Bouquet Canyon, L. A. Co.	Rabbit hunting.
Bussey, Marion	Self	Mar. 27	Los Angeles County	Squirrel hunting. Rifle accidentaly discharged when he stumbled on a log and fell.
Butts, Nolan (21)	Self	Dec. 10	Near Crows Landing	Quail hunting. Accidentally dropped gun.
Carr, Robert	H. A. Carnow	Dec. 23	East of Biggs	Quail hunting. Ejecting shells from gun accidentally discharged it.
Coffman, Glen	Unknown	Jan. 9	Near Maywood	Several boys together and rifle which one was carrying accidentally discharged.
Coghlan, John (40)	Self	Sept. 29	Near Sonora	Deer hunting. Placed rifle on rock and in climbing over it, rifle slipped and was discharged.
Colle, Dominick (15)	Self	Dec. 7	Point Reyes	Gun he was carrying accidentally discharged.
Conley, M. Neal (50)	Unknown	Sept. 22	Near Mineral	Deer hunting.
Contente, Herman	Self	July 13	Near Natoma District	Hunting jackrabbits. Party of 3 boys used one gun, and in passing it was accidentally fired.
Cordy, Chas. H.	Unknown	Dec. 14	Napa County	Quail hunting. In line of fire of other hunter.
Costillo, Joe (16)	Y. Soto	July 24	Near Compton	Rabbit hunting. Shooting accident.
Danley, George	Unknown	Nov. 27	Near Maxwell	Duck hunting. Fired in back by unknown hunter.
DeBorba, A.	Self	Aug. 10	Marin County Ignacio Gun Club	Deer hunting. Returning with deer, caught foot in a root on steep hillside, fell and broke his leg.
Dilloon, Lester (24)	Self	Sept. 31	Merced, Calif.	Deer hunting. Cleaning gun on return; rag caught the trigger.
Epkins, Roy (19)	Self	Dec. 15	Near Palmdale	Gun accidentally discharged.
Etter, Ira	Companion	Dec. 3	Richmond	Firing at sparrow, companion accidentally hit Etter.
Fiske, George	Self	Dec. 30	Rockaway Beach San Mateo Co.	Rabbit hunting. Shotgun accidentally exploded in his hands.
Fletcher, F. (45)	Self	Oct. 9	Near Standard City	Gun accidentally discharged.

Genazzia, R. (13)	Self	July 9	Near Penngrove	Crawling through fence, pulling gun after him, it was accidentally discharged.
Gallaway, R. (16)	Robert Lundeck	Nov. 29	Near Los Angeles	Was mistaken for rabbit as only legs were visible moving through the brush.
Gillis, Jack	Self	Aug. 30	Near Jamesburg	Deer hunting. In attempting to back down a water course, slipped, dropped rifle, which discharged.
Graves, Paul (17)	Self	Dec. 14	Glendale	Stopped at restaurant and gun accidentally discharged when knocked down.
Gray, John T.	Self	Sept. 24	Near Quincy	Deer hunting. Shot at deer, bullet hitting rock and rebounding.
Grumelli, Louis	Self	Oct. 26	Redding	Attempting to adjust some mechanism when gun went off.
Gwinn, Willard	Self	Mar. 21	Near Oceanside	Gun fell from runningboard of auto causing it to fire.
Hildebrand, S. R.	Self	Aug. 28	Acampo, San Joaquin Co.	Reached for rifle to shoot, sparrows annoyed him, and in pulling rifle over head it was discharged.
Hindley, Lewis	Brother	Dec. 8	Near Bonsall	Quail hunting. Stepped into line of fire.
Hines, Chas. (16)	Companion	Oct. 4	Los Angeles County—Topango Canyon	Rifle carried by companion accidentally discharged.
Holmes, Henry	Self	Oct. 6	Shasta County	Deer hunting. Accidentally shot himself in right forearm.
Hoyle, Richard (19)	Self	Aug. 12	Stough Canyon	Gun resting against his leg and in turning to see who was coming, accidentally touched trigger, discharging gun.
Houghton, Anson (42)	Self	Sept. 19	Tehama County—Near Bald Rock	Deer hunting. Rifle was leaned against car, fell to ground and was discharged.
Hugill, Douglas (18)	Fred Barnes	Sept. 26	Martinez, Calif.	Hunting rats. Accidentally shot.
Jenkins, Geo. W.	M. T. Stansbury	Dec. 30	Near Chico	Quail hunting.
Kaiser, Roy C.	Self	Oct. 13	Near Acton, L. A. Co.	Fell and broke leg while on hunting trip.
Klein, George (17)	Self	Feb. 3	Alameda County	Squirrel hunting. Rifle fired accidentally.
Larter, R. E.	Unknown	Oct. 8	Cal. Gun Club	Duck hunting. Hit by stray bullet.
Lockeridge, M.	Self	Oct. 8	Colusa County	Duck hunting. Gun fell to ground snapping trigger.
Lyon, Henry	Unknown	Sept. 3		Accidentally shot while on hunting trip.
Manassero, John (22)	Unknown	Sept. 18	Near Silver Lake—San Bernardino Co.	Deer hunting. Mistaken for deer.
Mariante, Patrick	Unknown	Sept. 2	Near Sacramento	Dove hunting. Shot by stray bullet.
McCoy, Edward	Brother	Apr. 12	Near Paso Robles	Gun accidentally discharged when trigger caught in tall grass.
McLain, L. (11)	Self	May 13	Happy Valley	Rabbit hunting, shot himself.
McPherson, Jerome (24)	Self	Sept. 16	Madera County	Deer hunting. Rested gun against tree, it fell and discharged.
Mercado, Joe	Self	Aug. 28	Laguna Junction Station	Stumbled and fell, accidentally discharging gun.
Millard, Earl (15)	Self	Mar. 24	Near Monterey Park	Rabbit hunting. Gun accidentally discharged while using butt to prod in a hole in ground.
Miravelle, Andrew	Self	Aug. 5	Near Beresford Park—San Mateo Co.	Gun accidentally discharged while dragging it through brush.
Miro, George	Self	Oct. 20	Lake Washington—Yolo Co.	Duck hunting. Dragging gun across bottom of boat, trigger caught on carlock, discharging gun.
Mosely, Robert	Self	Dec. 17	Near Colusa	Duck hunting. Crawling over ground, gun accidentally fired.
Nelson, Mervin (14)	Self	Feb. 8	Near Cordelia—Solano Co.	Apparently attempted to rest butt of gun on ground and received full blast under the arm.
Nelson, Geo. W.	Robt. Morton	Feb. 5	Near Groveland	Morton slipped in snow, fell and his revolver accidentally fired.

HUNTING ACCIDENTS, 1930—INJURED—Continued

Name	*Shot by*	*Date*	*Locality*	*Circumstances*
Newland, John	Self	Dec. 3	Laguna Beach	Gun dragged against shrubbery, pulling trigger.
O'Brien, Harry (17)	Joe Macedo	Jan. 23	Alameda County	Rabbit hunting. Three boys together saw hawk, dropped to ground and in some manner Macedo's gun was discharged.
Ontiveros, F. (32)	Self	Oct. 20	Near Santa Maria	Reached into wagon for gun, sudden jar caused it to fire.
Olms, Otto (26)	Self	July 31	Near Sespe	Deer hunting. In removing gun from front seat of auto, trigger caught, discharging it.
Oursler, Don E. (36)	Self	Sept. 9	Near Elsinore Riverside Co.	Shotgun propped against driver's seat discharged, probably caused by jolt of the car.
Parra, James	Unknown	Dec. 7	Babbs Canyon	Quail hunting. Shot in back by unknown person.
Phipps, Robt. (22)	Unknown	Aug. 31	Near Elsinore Riverside Co.	Dove hunting. Hunting with three companions, not known who fired shot.
Price, Harold (24)	Self	Dec. 27	Near Healdsburg	Gun accidentally discharged.
Rapley, C.	Companion	Sept. 8	Sonoma County Near Cazadero	Accidentally shot by companion.
Rattenburg, G. R.	Companion	Aug. 1	Yolo County N. of Winters	Twig from tree sprang back after companion pressed through brush, striking Rattenburg in eye, which was punctured by thorn.
Reese, Robert	Self	Jan. 1	Lake County	Rabbit hunting. Carrying revolver strapped to waist. Accidentally discharged.
Renfro, James (8)	Companion	Dec. 28	Santa Ana River	Rifle in hands of companion was dropped; in falling, discharged.
Roach, E. H.	Self	Sept. 11	Half Moon Bay	Stepped on gun as alighting from auto, discharging it.
Rock, Buddy (12)	Self	Dec. 16	Burlingame	Dropped his gun, causing it to fire.
Romero, E.	Unknown	Sept. 12	Ontario	Working on fruit farm; hit by stray bullet, thought to have been fired by some hunter.
Rudspeth, Donald (17)	Self	Dec. 15	North of Oxnard	Duck hunting. Shotgun accidentally discharged.
Samato, Joe (19)	Shide Nashumoto	Aug. 10	San Joaquin County	Boys were crawling under fence when Nashumoto's gun was accidentally discharged.
Schmidt, Roy (13)	Louis Morley	Jan. 4	Alameda County	Shooting birds.
Silva, Harold (17)	Self	Oct. 6	Near Bakersfield	Gun accidentally discharged as he was taking it from auto.
Simoni, Eugene (17)	Self	Dec. 3	Near Santa Rosa	Quail hunting. Leaned shotgun against fence and proceeded to climb fence, trigger accidentally touched and gun fired.
Stevens, Richard (21)	Self	Oct. 13	----------	Gun accidentally discharged.
Stier, John (13)	Al Yost	Apr. 18	----------	Yost picked up small caliber rifle and in fingering it, accidentally pulled trigger.
Stout, C. D.	Companion	Sept. 17	----------	Deer hunting. Stout left two companions and entered thicket for wounded deer. Companion mistook Stout for deer.
Tammy, Charles	Self	Sept. 24	Lassen County	Deer hunting. Shot and injured five-point buck, using last of ammunition. Overtook deer, which reared and charged and in the fray, before killing animal, was hooked in left forearm and thigh.

Tate, Louis (17)	Self	Dec. 7	Near San Luis Obispo	Quail hunting. Resting muzzle on foot when it accidentally discharged.
Vargas, Manuel (19)	Self	Sept. 1	Near Turlock Stanislaus Co.	Dove hunting. Accidentally discharged gun as he jumped from auto.
Vasco, Joseph (28)	A. Vincent	Aug. 11	Tassajara	Deer hunting. Vasco was looking for field glases which he had dropped and was mistaken for deer.
Whipple, Alva (15)	Self	July 8	Near Orland, Glenn Co.	Gun accidentally discharged in moving it to remove rear seat of auto.
Whitmire, Alvin (15)	Self	Jan. 15	Near Knights Landing Yolo Co.	Duck hunting. Accidentally cut right hand.
Wicking, Carl (44)	Self	Dec. 7	Near Hemet	Quail hunting. Tripped over rock and gun discharged.
Wilson, Roy	Self	Jan. 2	Van Nuys, Calif.	Cleaning gun, accidentally shot himself.
Winsby, Mervin (15)	Wm. Jones	Aug. 6	Reeves Canyon	Deer hunting. Mistaken for a deer.
Woods, Wm.	Self	Dec. 9	10 mi. S. W. Gustine	Goose hunting. Car parked on incline started rolling. In attempt to put on emergency brake while holding gun, trigger caught and gun fired.
Wright, W. C.	Wm. Crossland	Dec. 14	Near Fresno	Wright stepped into line of fire.
Young, Raymond	Companion	Dec. 28	Near Manteca	Rabbit hunting. Companion fired at rabbit, one of the birdshot hitting Young.

REPORTS

SEIZURES OF FISH AND GAME

April, May, June, 1931

Fish		
Abalones	pounds	496
Barracuda	pounds	2,293
Bass—		
Black		278
Striped		180
Bluegills, crappie, perch		441
Clams		1,644
Corbina		4
Croaker, spotfin	pounds	15
Crayfish		31
Grunion		7
Shad	pounds	550
Salmon		12
Smallfish		150
Trout		2,066
Trout	pounds	70
Traps (fish)		24
Nets		2
Tuna (Bluefin)		24,144
Game		
Deer		78
Deer meat	pounds	407
Dove		1
Grouse		2
Pigeon		1
Quail		5
Rabbits		30
Shorebirds		3
Squirrel		2
Nets, bird		2

FISH CASES

April, May, June, 1931

	Number arrests	*Fines imposed*	*Jail Sentences (days)*
Angling License Act; violations of	121	$2,091 00	48
Abalones; overlimit; small	74	1,975 00	---
Barracuda; small	6	135 00	---
Bass—			
Black; closed season	25	425 00	---
Striped; small; closed season	36	560 00	10
Clams; small; overlimit	58	1,130 00	430
Corbina; selling of	1	-------	---
Crabs; small	4	45 00	---
Crayfish; taking of in district 4	2	15 00	---
Crappie; perch; bluegill; closed season	23	385 00	---
Commercial Fishing License Act; violations of	12	105 00	---
Explosives; use of to take fish	2	400 00	---
Fishing near dam, fish ladder or too near mouth of stream	8	239 00	68
Grunion; closed season	1	10 00	---
Illegal fishing apparatus; gaff hooks, spears, etc.	16	310 00	---
Nets, seines; illegal use of	15	1,105 00	100
Night fishing	2	50 00	---
Pollution of streams	7	125 00	---
Salmon; closed season	1	50 00	---
Spotfin croaker; selling of	1	25 00	---
Sea lion; killing of	1	100 00	---
Trout; closed season; overlimit	86	2,445 00	25
Totals	502	$11,725 00	681

GAME CASES

April, May, June, 1931

	Number arrests	*Fines imposed*	*Jail Sentences (days)*
Deer; closed season	61	$2,654 00	548
Ducks; closed season	2	-------	---
Grouse; killing of	1	25 00	---
Hunting License Act; violations of	13	228 00	6
Hunting in game refuge	4	59 00	1
Night hunting	3	100 00	25
Nets (bird); illegal	1	-------	---
Pheasants; killing of	3	350 00	---
Pigeons; closed season	1	-------	25
Quail; closed season	2	-------	90
Rabbits; closed season	18	270 00	40
Shorebirds; killing of	2	25 00	---
Squirrel; killing of	1	-------	1
Songbirds; trapping of	2	50 00	---
Totals	114	$3,761 00	736

STATEMENT OF EXPENDITURES

For the Period July 1, 1930 to June 30, 1931, of the Eighty-second Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Administration:					
Executive	$6,000 00			$6 46	$6,006 46
Clerical and office	21,581 22	$974 22	$607 51	561 57	23,724 52
Printing		18,849 57			18,849 57
Automobiles		331 74	190 96	1,503 90	2,026 60
Traveling			2,873 90		2,873 90
Postage			5,046 06		5,046 06
Telephone and telegraph			4,197 48		4,197 48
Freight, cartage and express			2,057 00		2,057 00
Rent			14,572 22		14,572 22
Heat, light and power			27 44		27 44
Accident and death claims			7,272 89		7,272 89
Accounting pro rata	4,500 00				4,500 00
Legal	6,600 00		333 15	177 55	7,110 70
Publicity			257 41		257 41
Total administration	$38,681 22	$20,155 53	$37,436 02	$2,249 48	$98,522 25
Education and research:					
Chief and assistant	$9,385 00			$12 92	$9,397 92
Clerical and office	1,920 00	$342 65	$282 85	347 58	2,893 08
Traveling			7,482 16		7,482 16
Telephone and telegraph			32 24		32 24
Freight, cartage and express			18 56		18 56
Photographer	1,200 00		68 00	1,182 15	2,450 15
Librarian	1,912 90	121 62	98 72	267 69	2,400 93
Research	8,638 71	487 67	2 00	9 75	9,138 13
Publicity			413 31		413 31
Exhibits			75 75	50 00	125 75
Temporary help	1,165 00				1,165 00
Summer educational work	546 68				546 68
Total education and research	$24,768 29	$951 94	$8,473 59	$1,870 09	$36,063 91
Patrol and law enforcement:					
Chief and assistants	$10,823 00			$6 46	$16,829 46
Clerical and office	3,057 50	$347 21	$16 80	120 86	3,542 37
Automobiles		9,298 47	4,014 89	14,157 68	27,471 04
Traveling			130,318 78		130,318 78
Postage			672 11		672 11
Telephone and telegraph			2,105 39		2,103 39
Freight, cartage and express			70 07		70 07
Rent			752 02		752 02
Captains and deputies	208,137 82	1,497 41	228 66	245 14	210,109 03
Launches	2,040 00	1,427 40	1,446 64	165 90	5,079 94
Fish planting	2,350 36	778 20	148 80	1,085 05	4,362 41
Volunteer deputies	885 00	46 19			931 19
Premiums on bonds			3,910 89		3,910 89
Temporary help	780 50				780 50
Heat, light and power			15 99		15 99
Total patrol and law enforcement	$228,074 18	$13,394 88	$143,701 04	$15,781 09	$400,951 19
Commercial fisheries:					
Chief and assistants	$12,270 00				$12,270 00
Clerical and office	9,471 67	$239 74	$108 57	$820	9,828 18
Automobiles		741 56	367 74		1,109 30
Traveling			21,236 27		21,236 27
Postage			6 17		6 17
Telephone and telegraph			484 12		484 12
Freight, cartage and express			259 60		259 60
Rent			927 50		927 50
Heat, light and power			293 18		293 18
Research	9,613 87	63 40	17 90	133 73	9,828 90
Inspectors	19,406 90				19,406 90
Captains and deputies	13,782 50	162 14	40 27		15,984 91
Launches	12,761 54	6,225 44	3,708 30	4,890 99	27,586 27
Laboratory	31,947 05	1,150 19	1,992 31	2,190 87	37,280 42
Blue printing			15 29		15 29
Fish tags		382 00			382 00
Salmon tagging			3 50		3 50
Botulism			15,000 00		15,000 00
Hydro-biological survey, Monterey Bay			1,500 00		1,500 00
Statistics	2,940 00	2,538 69	1,393 38	203 00	7,077 07
Publicity			1 05		1 05
Total commercial fisheries	$114,193 53	$11,503 16	$47,355 15	$7,428 79	$180,480 63

STATEMENT OF EXPENDITURES

For the Period July 1, 1930 to June 30, 1931, of the Eighty-second Fiscal Year—Continued

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Fish culture:					
Chief and assistants	$6,691 61		$4 00		$6,695 61
Clerical and office	3,972 58	$91 80	18 43	$63 00	4,143 81
Automobiles		5,431 38	2,577 20	8,697 27	16,705 85
Traveling			11,655 21		11,655 21
Postage			106 57		106 57
Telephone and telegraph			1,145 27		1,145 27
Freight, cartage and express			1,725 15		1,725 15
Rent			1,695 61		1,695 61
Heat, light and power			886 42		886 42
Hatcheries	137,016 58	71,160 24	1,572 00	2,064 41	211,813 23
Hatcheries—additions and betterments				53,762 59	53,762 59
Special field investigations	12,326 33	160 28	32 62	20 00	12,539 23
Fish cars	2,396 52	467 20	2,325 93	141 45	5,531 10
Blue printing			5 10		5 10
Cooperative research	10 00	11 61	32 40	741 99	796 00
Total fish culture	$162,613 62	$77,322 51	$23,781 91	$65,490 71	$329,208 75
Hydraulics:					
Chief and assistants	$7,200 00		$3 06		$7,203 06
Clerical and office		$75 25	182 06		257 31
Automobiles		466 09	220 28	$1,077 50	1,763 87
Traveling			1,953 10		1,953 10
Telephone and telegraph			8 89		8 89
Blue printing			14 09		14 09
Cooperative research	3,000 00				3,000 00
Postage			2 00		2 00
Publicity			2 52		2 52
Total hydraulics	$10,200 00	$541 34	$2,386 00	$1,077 50	$14,204 84
Game propagation:					
Superintendents	$7,865 00				$7,865 00
Automobiles		$446 34	$202 64		648 98
Traveling			1,671 61		1,671 61
Postage			19 57		19 57
Telephone and telegraph			220 12		220 12
Freight, cartage and express			59 31		59 31
Heat, light and power			1,220 94		1,220 94
Maintenance		10,773 76	2,757 91	$5,983 58	19,515 25
Temporary help	4,815 18				4,815 18
Assistants	4,440 00				4,440 00
Purchase of game birds		3,963 93			3,963 93
Total game propagation	$17,120 18	$15,184 03	$6,152 10	$5,983 58	$44,439 89
Fish rescue:					
Chief and assistants	$4,670 00	$30 58	$191 39		$4,891 97
Traveling			1,978 51		1,978 51
Rent			238 00		238 00
Temporary help	353 00				353 00
Total fish rescue	$5,023 00	$30 58	$2,407 90		$7,461 48
Game refuge:					
Chief and assistants	$4,000 00				$4,000 00
Clerical and office	2,268 45	$1 65	$13 75		2,283 85
Automobiles		809 55	464 29	$1,969 34	3,243 18
Traveling			1,754 32		1,754 32
Postage			49		49
Freight, cartage and express			50		50
Lion hunters and trappers	9,132 00				9,132 00
Refuge posting	6,660 82	4 80			6,665 62
Predatory animal control			7,290 00		7,290 00
Refuge maintenance	2,659 55	2,343 08	1,399 88	6,248 20	12,650 71
Telephone and telegraph			2 40		2 40
Publicity			8 20		8 20
Total game refuge	$24,720 82	$3,159 08	$10,933 83	$8,217 54	$47,031 27
License commissions					$59,225 00
Purchase lease and improvements of game refuges					133,417 00
State fair and other exhibits					4,995 55
Prior year expense—81st fiscal year only					4,023 32
Prior year expense—80th fiscal year only					4,821 87
Expenditures to pay claim of Fred F. Freitas—Chap. 403-29					10 00
Opening channel of Salinas River					2,433 47
Protecting the construction on the Russian River Jetty					11,959 11
Grand total, proprietary group					$1,379,249 53

STATEMENT OF INCOME

For the Period July 1, 1930, to June 30, 1931, of the Eighty-second Fiscal Year

License sales	Detail	Total
Departmental income:		
Angling licenses, 1930	$429,202 50	
Angling licenses, 1929	450 00	
Angling licenses, 1931	76,111 00	
Commercial hunting club licenses, 1930-31	2,110 00	
Commercial hunting club operators' licenses, 1930-31	620 00	
Deer tags, 1930	123,999 00	
Fish breeders' licenses, 1930	25 00	
Fish breeders' licenses, 1931	435 00	
Fish importers' licenses, 1930	10 00	
Fish importers' licenses, 1931	75 00	
Game breeders' licenses, 1930	142 50	
Game breeders' licenses, 1931	882 50	
Hunting licenses, 1929	100 00	
Hunting licenses, 1930	439,942 70	
Hunting licenses, 1931	24,342 00	
Kelp licenses, 1931	30 00	
Market fishermen's licenses, 1930-31	29,680 00	
Market fishermen's licenses, 1931-32	27,220 00	
Trapping licenses, 1930-31	2,860 00	
Wholesale fish packers' and shell fish dealers' licenses, 1930-31	1,125 00	
Wholesale fish packers' and shell fish dealers' licenses, 1929-30	5 00	
Total licenses sales		$1,159,367 20
Other income:		
Contributions from importers	$150 00	
Court fines	68,178 78	
Fish packers' tax	122,103 29	
Fish tag sales	2,817 37	
Game tag sales	104 28	
Interest on bank balances	5,861 72	
Kelp tax	152 78	
Miscellaneous sales	376 05	
Total other income		199,744 27
Total departmental income		$1,359,111 47
Income for the State University Fund:		
Kelp tax	$73 34	$73 34

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF APRIL, MAY AND JUNE, 1931

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Anchovies							66,335	50	14,435
Barracuda								3	281
Bonito								48	172
Carp				3,402	376	5,829			
Catfish				256	62,553	22,343			
Cultus-cod	218,919	3,921					50,199	4,524	22,212
Eels							40		
Flounders	410	4,940				21	3,106	913	160
Grayfish					12		820		
Hake	250						4,725		
Halibut	264,584	1,500	131				1,281	1,726	1,691
Hardhead					3				
Herring							2,385		
Kingfish							2,604	4,347	20,577
Mackerel								4,491	378,825
Mackerel—Horse									10,544
Mullet									
Perch	1,806		9,450				3,192	3,170	18,524
Pike				4	48	113			
Pompano							20	20	154
Rock Bass									
Rockfish	83,626	2,798					210,268	196,107	410,119
Sablefish	166,318	1,420					7,425	31,411	3,721
Salmon	717,164	301,849		61,966	135,393	223,983	12,340	9,330	20,400
Sandabs	6,443	2,080					44,146	708	3,546
Sardines							773,615	12,870	225,455
Sculpin							400	105	
Sea Bass—Black									
Sea Bass—White							44	679	170
Shad				19	345	736	95,491		
Shad—Buck				10,041	17,268	89,366			
Shad—Roe				86,269	42,995	439,457	95		

Sheepshead									
Skates	203	130					11,206		1,961
Skipjack									
Smelt	10,105	704	7,330				85,640	34,878	51,975
Sole	1,333,927	17,870					58,678	14,092	41,381
Split-tail					12	769			
Striped Bass	203			16,847	65,454	242,400	8,102		
Suckers					8				
Swordfish									
Tomcod							142		
Tuna—Bluefin									
Tuna—Yellowfin									
Turbot			1,032				10,566		
Whitebait	41,724	28,456	1,035		427		2,658		35
White-fish									
Yellow-tail									
Miscellaneous	1,816	189			545	274	116		835
Total fish	2,847,498	365,857	18,978	178,804	325,439	1,025,291	1,455,639	319,472	1,226,273
Crustaceans:									
Crabs	[1]48,552						[3]764,160	[5]1,608	
Shrimps			93,005				379,541		
Spiny Lobsters									
Mollusks:									
Abalones									1,057,900
Clams—Cockle			30,121						
Clams—Mixed	1,505								
Clams—Pismo								96	924
Clams—Softshell		70	23,504			4,145	977		
Cuttlefish		200					2,170	706	25,697
Mussels									200
Oysters—Eastern			[2]30,578				[4]61,600		
Oysters—Native	6,530		22,297				8,607		
Squid								22,300	1,012,738
Miscellaneous:									
Turtles									
Totals	2,904,085	366,127	218,483	178,804	325,439	1,029,436	2,672,694	344,182	3,323,732

All amounts shown in pounds unless otherwise specified. Skipjack and Albacore cleaned.

[1] 2,023 dozen.
[2] 138,990 shell oysters.
[3] 31,840 dozen.
[4] 280,000 shell oysters.
[5] 67 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF APRIL, MAY AND JUNE, 1931—Continued

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into California via San Pedro	Fish from south of the International Boundary brought into California via San Diego	Total fish from south of the International Boundary brought into California
Anchovies		18,176	570		99,566			
Barracuda	1,506	1,189,792	17,531	504,585	1,713,698	59,980	26,891	86,871
Bonito	27	83,125	4,906	25,601	113,879	21,402	270	21,672
Carp		2,500			12,107			
Catfish					85,152			
Cultus-cod		40	35		299,850			
Eels		100			140			
Flounders		80	28		9,658			
Grayfish	55	60,194	37,819	57,000	155,900			
Hake		285			5,260			
Halibut	94,419	100,659	7,005	23,887	496,883		12,579	12,579
Hardhead					3			
Herring					2,385			
Kingfish	18	73,506	657	622	102,331			
Mackerel	36,147	2,010,488	24,535	49,885	2,504,371			
Mackerel—Horse		16,430			26,974			
Mullet		1,710	505	2,581	4,796	3,865		3,865
Perch	2,462	13,014	68	290	51,976			
Pike					165			
Pompano		1,030	22	588	1,834			
Rock Bass	5,596	82,322	28,338	70,549	186,805	4,764	2,533	7,297
Rockfish	18,975	872,954	7,228	271,088	2,073,163			
Sablefish		2,155	278		212,728			
Salmon					1,482,425			
Sandabs		2,399	524		59,846			
Sardines	35	29,703	1,160	28,768	1,071,606			
Sculpin		21,519	916	1,515	24,455			
Sea Bass—Black	1,084	9,754	13,532	46,989	71,359	9,049	35,920	44,969
Sea Bass—White	10,665	133,525	1,994	29,017	176,094	4,475	36,897	41,372
Shad					96,591			
Shad—Buck					116,675			
Shad—Roe					568,816			

Sheepshead	442	30,223	106	1,251	32,022		105	105
Skates		7,231	446		20,277			
Skipjack						243,599	291,580	535,179
Smelt	5,545	68,408	565	7,319	272,469			
Sole	72,896	13,359	875	19	1,553,097			
Split-tail					781			
Striped Bass					333,006			
Suckers					8			
Swordfish		27,032		31,725	58,757			
Tomcod					142			
Tuna—Bluefin		1,288,621		119	1,288,740	698,999	7,140	706,139
Tuna—Yellowfin						1,651,295	7,189,921	8,841,216
Turbot					11,598			
Whitebait					74,335			
White-fish		10,654	70	23,551	34,275	5,163	602	5,765
Yellow-tail	258	226,800	3,573	434,390	665,021	152,047	130,476	282,523
Miscellaneous	380	34,168	441	423	39,187	15,771	4,508	20,279
Total fish	250,510	6,431,956	153,727	1,611,762	16,211,206	2,870,409	7,739,422	10,609,831
Crustaceans:								
Crabs					[1]814,320			
Shrimps					472,546			
Spiny Lobsters						2,925	51,729	54,654
Mollusks:								
Abalones	22,297				1,080,197			
Clams—Cockle		6,571			36,692			
Clams—Mixed		3,138			4,643			
Clams—Pismo	25,844				26,864			
Clams—Softshell					28,696			
Cuttlefish		69	2		28,844			
Mussels					200			
Oysters—Eastern					[2]2,178			
Oysters—Native					37,434			
Squid		220			1,035,258			
Miscellaneous:								
Turtles							3,931	3,931
Totals	298,651	6,441,954	153,729	1,611,762	19,869,078	2,873,334	7,795,082	10,668,416

[1] 33,930 dozen.
[2] 418,990 shell oysters.

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San Francisco, California

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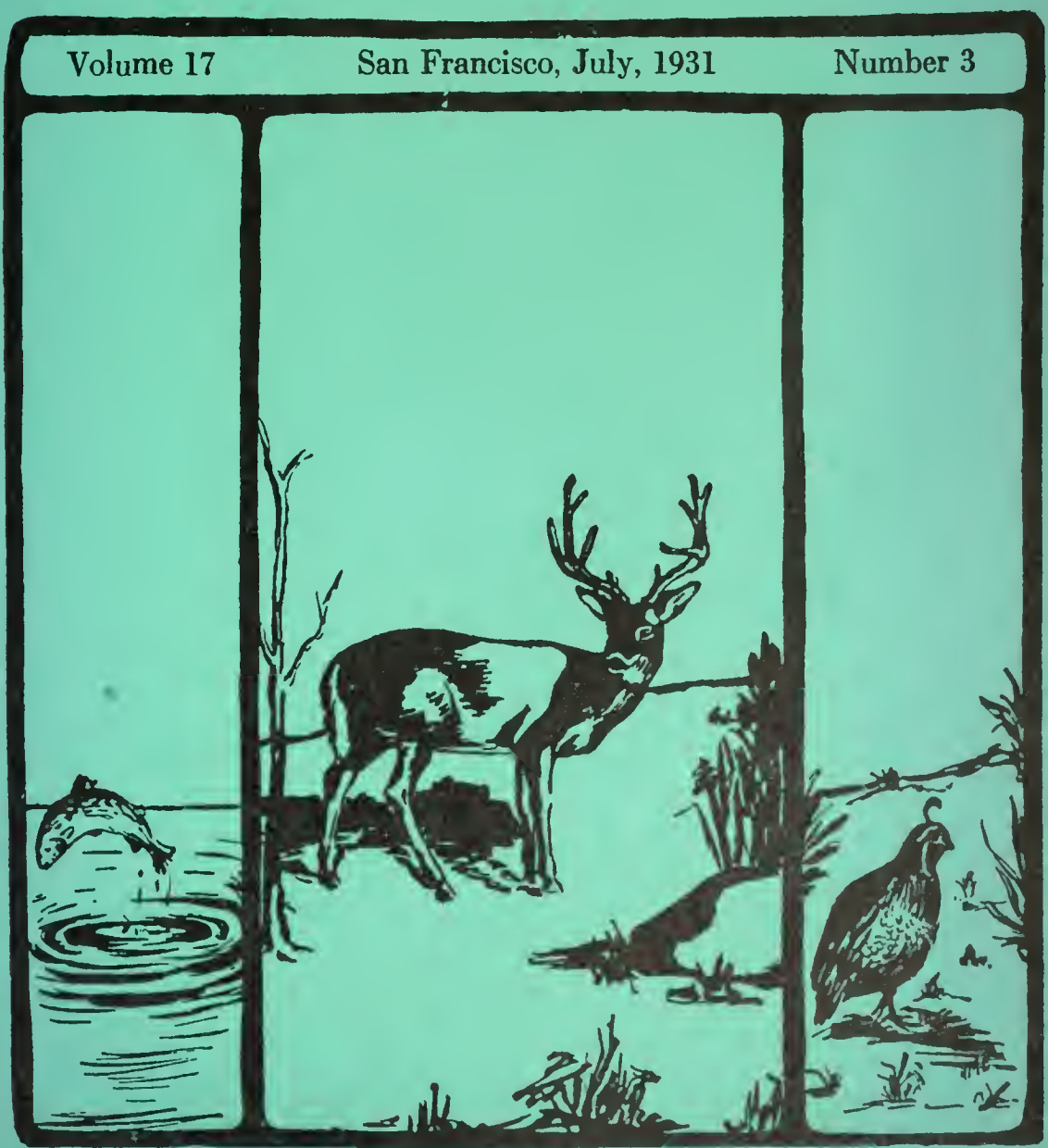
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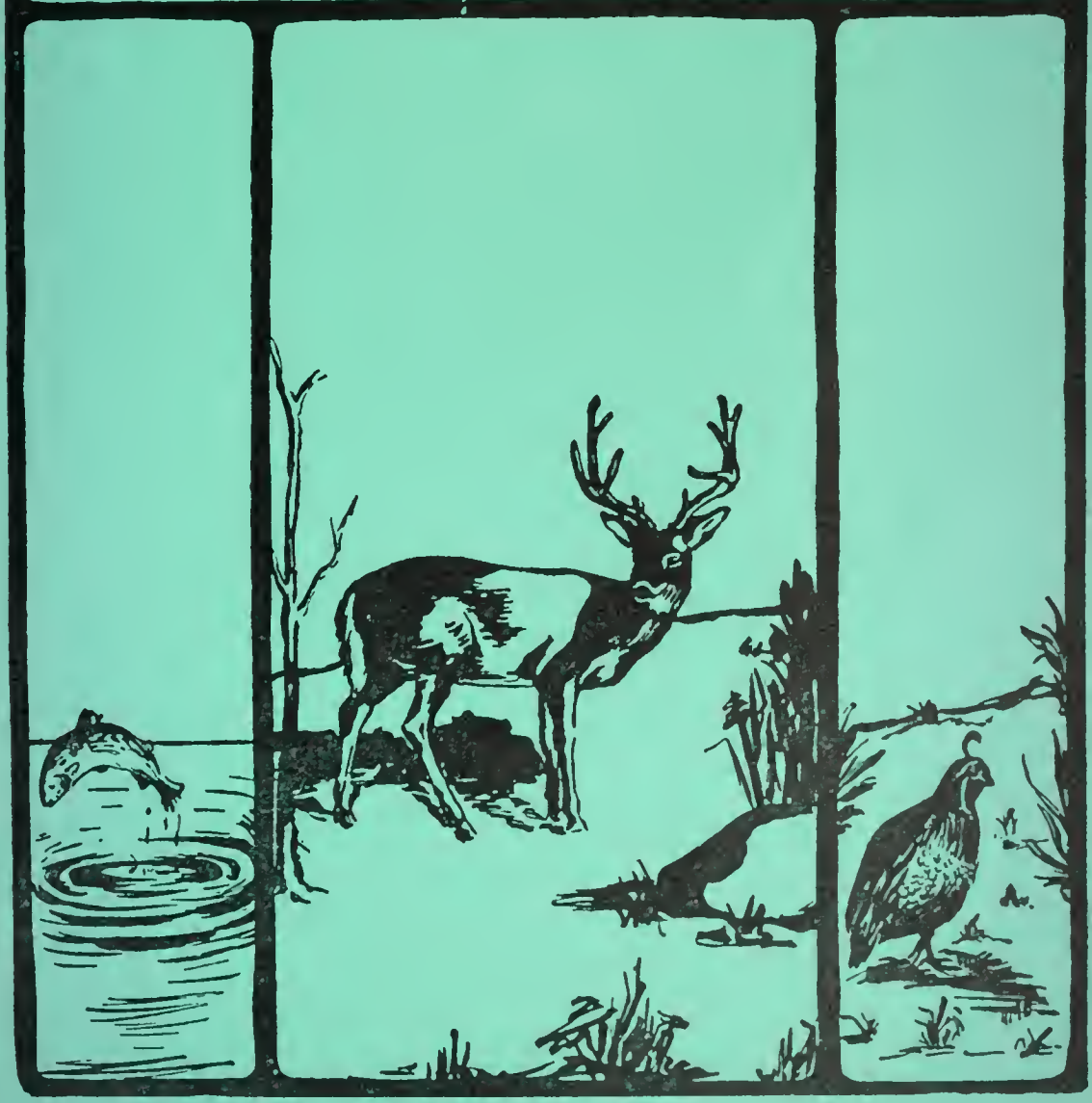
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